THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 24 NEW YORK, APRIL, 1926 No. 4

Handy & Harman

A History of This Precious Metal House Now 59 Years Old

Perhaps no other firm in the world is better known in the precious metal field than this old established house. Founded in 1867, just after the Civil War, it has occupied, ever since, a prominent place in the trade. The business of supplying gold, silver and platinum, as well as silver solders and other precious metal alloys, in sheet and wire for manufacturing, has grown into a most important industry.

In the old days, the manufacturer was forced to purchase what he could get, which in many instances meant that he was obliged to use metals of questionable merit. Impurities seriously affected the working quality of precious metals, causing black anodes in the electroplating operation and numerous difficulties with sterling silver alloys. It has been only in recent years that these costly troubles have been eliminated for the manufacturer through progress and standardization in refinery methods.

FIG. 1. CHARLES S. PLATT PLANT, NEW YORK CITY

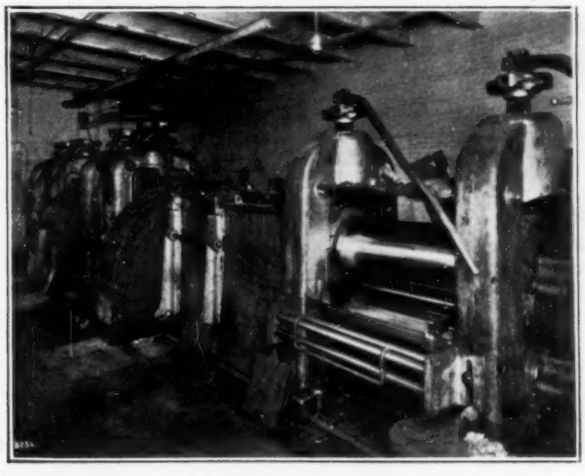


FIG. 2. SILVER ROLLS WITH 40" FACE

About 89 years ago, the business of the Charles S. Platt Company, to which Handy & Harman succeeded, was established in New York City. This old firm was among the first to import platinum, but found it a drug on the market, and it was not until 1879, when Edison invented the incandescent lamp that there was any demand for the metal. It is interesting to note in passing that platinum sold at $6.00 an ounce at that time. The Charles S. Platt Company was among the first to produce sterling silver sheet, silver solder, karat gold and fine silver anodes for plating. This company also operated the first sulphuric acid plant for the refining of precious metals in the United States.

The old plant of Charles S. Platt Company at 29 Gold street, built in 1890 for the refining and manufacturing of precious metals, has recently been replaced by a new building. The original building was equipped with unique silver melting furnaces, rolling mills, one of which had a 40 in. face (see Fig. 2), and wire drawing equipment, some which was almost 100 years old. All of this finally had to make way for progress in the industry, and the plant, which had been operated for nearly ten years by Handy & Harman, has been recently dismantled. The new New York plant of Handy & Harman is located at Fulton and Gold streets, half a block north of the old address. This branch, maintained for the convenience of the trade in New York, is a miniature of the main factory

at Bridgeport, and is provided with the most modern melting and rolling equipment and is adapted to the needs of the local industry.

The principal plant of Handy & Harman, located at Bridgeport, Connecticut, supplies the requirements of the largest manufacturers in the United States and Canada with .999 "plus" fine silver anodes for plating, sterling silver sheet and wire in various forms and sizes for making sterling silverware, silver solder for every conceivable purpose, and silver and gold in various other forms.

The chief refinery of the company is also located at Bridgeport, and is probably the largest of its kind in the country devoted to the handling of precious metal waste resulting from various manufacturing processes. Material is received here from all parts of the world. It comes in all forms—from carloads of photo paper and polishing waste to the little tin box of platinum filings sent in by the small manufacturing jeweler.

To take care of the demands of the trade in the Providence district, a refinery service plant is operated by the company at 425 Richmond street, Providence, R. I.

The executive, sales, accounting and credit offices of Handy & Harman have been located for 59 years within a block of the present office on Cedar street, New York City, and on May 1, will be moved to the new Wadsworth Building, 57 William street, at the corner of Cedar street. In addition to the extensive operations of the company in the domestic market, Handy & Harman also transact a considerable business in the export field.

The officers of the company are:

John F. Harman, Chairman of the Board, who has been with the company during its 59 years.

Parker D. Handy, President, a son of the founder.

Cortlandt W. Handy, Executive Vice-President.

Geo. C. Gerrish, Vice-President & Production Manager.

G. H. Niemeyer, Vice-President & Sales Manager.

Joel L. Brush, Treasurer.

H. W. Spaulding, Secretary.

H. W. Boynton, Assistant Treasurer.

FIG. 3. BRIDGEPORT PLANT

A Description of the New Plant

Written for The Metal Industry by F. A. WESTBROOK, Consulting Engineer

The entire installation of the new plant in New York, including electrical and millwright work, was made by MacNutt, Watts & Tankard, New York. The commercial part of the establishment, including the safe and weighing arrangements, is located on the ground floor and the mechanical equipment in the basement. The latter is very well laid out and therefore interesting.

All machinery is electrically operated, the power being brought in from the street to a meter-panel. Edison three-wire direct current service at 110 volts for lighting and 230 volts for power is used. From the meter the power is carried to a distribution panel located near it. The wires to the electric motors which drive the machinery are run direct from the 2 wire fuse gaps at the top of the panel box to the control apparatus and motors; and from the 2 wire fuse gaps with solid neutral at the bottom of the panel box for lighting. The lighting wires, however, instead of going direct to the lamps serve small lighting distribution panels with controlling push switches in the face of the trim located at convenient points around the various floors and from which lighting panels the circuits run concealed in the ceiling to the lighting fixtures. Thus it is possible to control any fixture, or group of fixtures, from a convenient central point, as well as at individual fixtures, without going to the main panel which may be considerably out of the way and take time to reach.

All wires, whether to lights, controllers or motors, have been placed in iron pipe conduit run along the ceiling and down pillars or, in some instances, under the floor, as

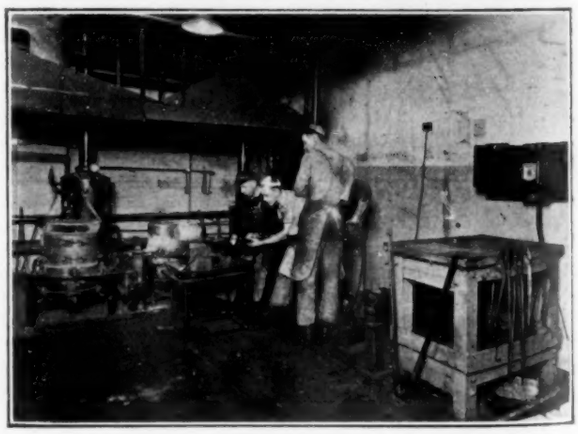


FIG. 4. POURING MOLTEN GOLD FROM A CRUCIBLE INTO A MOLD. NOTE THE GAS CRUCIBLE FURNACES AND THE GAS BOILER IN THE BACKGROUND

most convenient. This is shown in several of the pictures.

One of the most interesting features of this small, but very efficient, plant is the neat and well arranged department for smelting on a small scale. Of course, a great many people in the jewelry trade in New York, as well as others, send in a variety of scraps of precious metals for credit. These must be melted down and cast into ingots from which samples are taken for analysis. This smelting is done in the small crucible furnaces shown in Fig. 4. The samples are sent to the laboratory at the company's main plant at Bridgeport.

The furnaces are gas heated. Over them are hoods for carrying off the fumes. An exhaust draft is created by means of a motor driven exhaust fan four feet in diameter which also removes the fumes from the acid cleansing baths. In this same department, just to the left of the furnaces, but not shown in the picture (Fig. 4) is the gas heated annealing furnace for softening drawn wire and rolled sheets. The cleansing baths are necessary because this is an open furnace and a slight surface oxidation occurs on the metals placed in it.

A gas boiler to make steam for the baths is shown in Fig. 4 behind the largest crucible furnace at the left of the picture. This is only used in case of emergency because it has been found cheaper to purchase steam from the New York Steam Company, which distributes this commodity through the streets in this part of the city.

Of the electrically driven machinery, a wire drawing machine is operated by a motor mounted on the ceiling and controlled by means of the enclosed starting box and safety disconnect switch on a pillar. Another motor mounted on the ceiling drives a shaft from which two metal working machines in the background are driven. By thus mounting the motors on the ceiling and the control apparatus on the pillars a great deal of valuable floor space is saved.

It is an interesting fact that the old-fashioned hand wire drawing bench, shown in Fig. 5, is still used to start the reduction in diameter of the wire before it is placed in the motor driven machine. In spite of the fact that this particular bench is almost one hundred years old, it is an essential unit in the establishment and is used daily simply because nothing else has been found which is better for this specific purpose in a plant of this kind.

In other cases, however, as with the large sheet rolls shown in Fig. 6, the 50 h.p. motors are placed on the floor, on the same bed-plate as the roll. This was done because it was possible to do so without materially restricting floor space and because it is obviously impracticable to mount such large motors on the ceilings of a building of this character. It is interesting to note how the large driving gears are enclosed to comply with safety requirements.

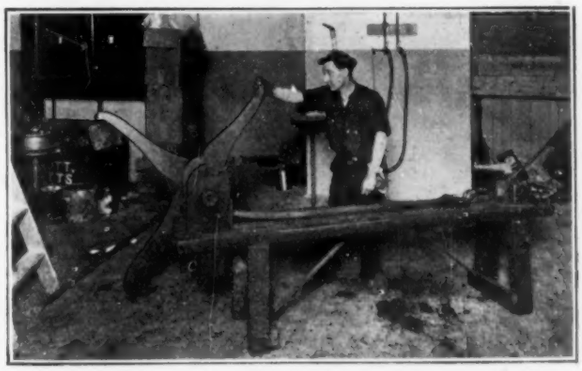


FIG. 5. OLD FASHIONED HAND WIRE DRAWING BENCH

There are two other interesting and practical electrical features about these large rolls. One is the push-button control directly in front of where the operator stands and by means of which the machine may be stopped instantly, and the other is the ammeter on the top of the controller box. By this the operator can tell at once if he is attempting too great a reduction in the thickness of the sheet at one step for, if so, the ammeter will show that the motor is drawing an amount of current which is in danger of blowing the fuses in the circuit. Fuses are necessary in any event for the protection of the motor, in case the operator makes some mistake or forgets to look at the ammeter; but by careful observation of the meter a great

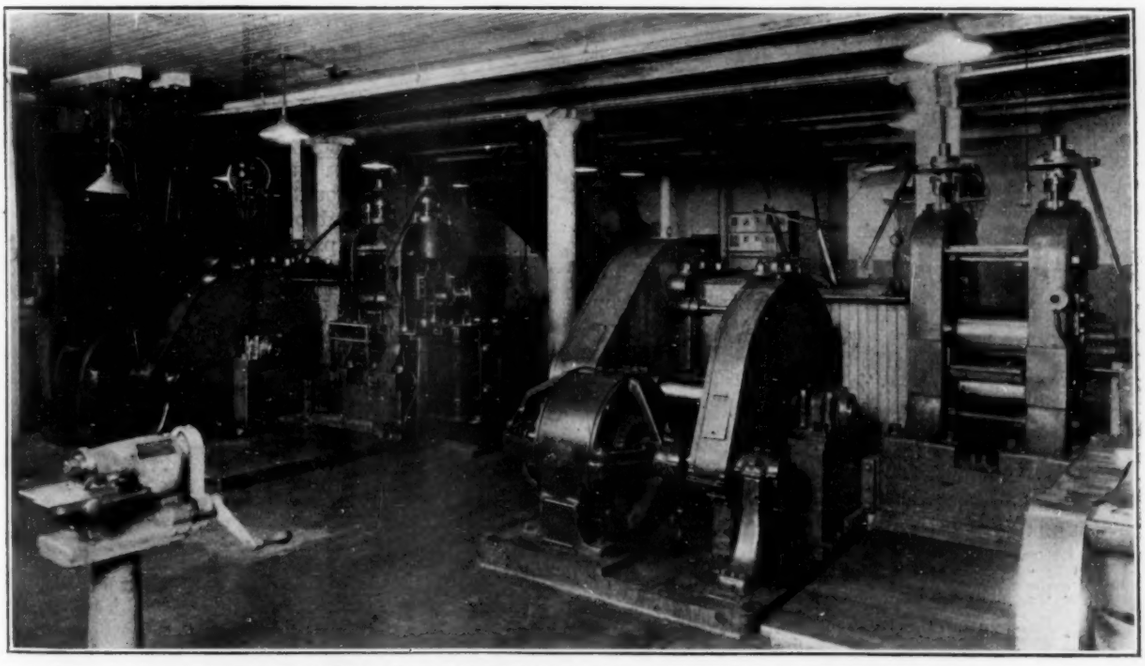


FIG. 6. SHEET METAL ROLLS WITH 50 H.P. INDIVIDUAL GEARED MOTORS

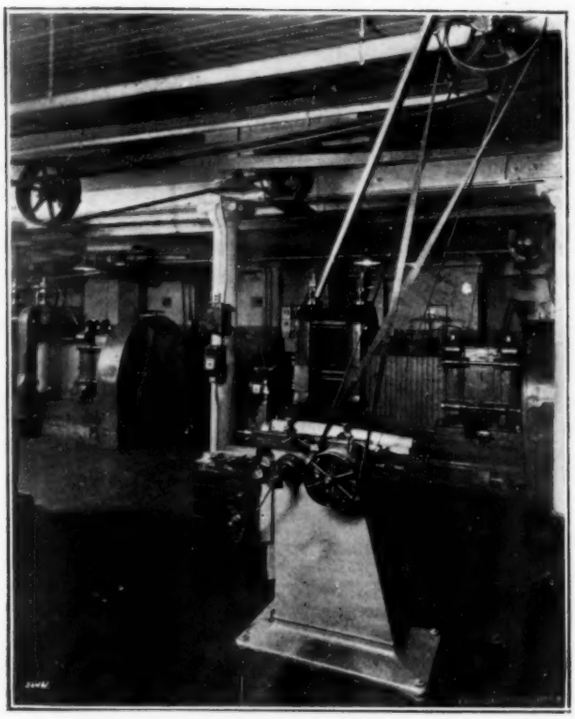


FIG. 7. VIEW OF SHOP SHOWING MOTORS MOUNTED ON CEILING, DRIP PANS AND CONTROL APPARATUS MOUNTED ON PILLAR

deal of time and expense can be saved which would otherwise be wasted by the frequent blowing of fuses, as would be well nigh unavoidable if this means of preventing it were not provided.

In planning the equipment for an installation of this kind it is, of course, necessary to do everything possible to reduce power losses to a minimum. To this end roller bearings have been used for all shafting bearings and the motors have been selected in comparatively small sizes so that in most cases not more than two machines are driven by the same motor, while in several instances each machine has its own motor. In this way it is not necessary to run a lot of shafting, with its attendant losses, in order to operate one machine.

FIG. 8. FIRE UNDERWRITERS BUILDING ON SITE OF OLD CHARLES S. PLATT PLANT

The old plant has been torn down to make room for the fourteen-story fireproof structure of the National Board of Fire Underwriters, erected at the northwest corner of John and Gold streets.

Metallic Antimony

WRITTEN FOR THE METAL INDUSTRY BY JESSE L. JONES, METALLURGICAL EDITOR

Metallic antimony is not sold on a minimum metallic content of, say 98 per cent, as is the case with zinc, but it is sold by brand. Of the English brands, that of Cookson & Company, Ltd., is very highly regarded, as is also the brand of Hallett & Son.

The question of making specifications for antimony has been considered by the American Society for Testing Materials, but owing to the fact that no antimony is produced in the United States, it has not been considered practical to attempt to enforce specifications for it. China is the largest producer of antimony ore, although considerable amounts come from Mexico, Bolivia and Algeria. The better grade of antimony will average above 99 per cent purity. Impurities are small amounts of lead, arsenic, copper, iron, zinc, nickel, sulphur, etc. Of these impurities, arsenic is possibly the most detrimental, as antimony is largely used in making babbitt and any appreciable amount of arsenic will make babbitt much more brittle, although possibly increasing its fluidity.

"Star antimony is still regarded very favorably by the market. The alkaline flux, which is used to refine the antimony, is instrumental in the amount of the so-called "stars," which is considered an infallible indication of quality. This, of course, is not the case as far as purity of composition is concerned, but the "stars" undoubtedly are an indication of freedom from dross, etc.

Pinches in Rolling Nickel Silver

WRITTEN FOR THE METAL INDUSTRY BY WILLIAM J. PETTIS, ROLLING MILL EDITOR

Q.—Please give me the standard "pinches" used in reducing nickel silver.

A.—Except in a general way there are no standard reductions. The amount of reductions on each pass and the total reduction given the bar before annealing are governed by many factors such as strength of rolls, power behind them, method of annealing, nickel contents and individual ideas on pressure distribution. Here are two examples from different mills that are big producers of this metal:

(1) Casting, one and one-eighth inch thick, four to eight inches wide, alloy 18 per cent to 21 per cent nickel.

Reductions—1⅛″ to ¾″, three passes, anneal.
¾″ to ½″, three passes, anneal.
½″ to 15/32″, overhaul and continue reductions to number 2 B and S.

(2) Casting one and three-eighth inches thick, four to eight inches wide; alloy 18 per cent nickel.

Reductions—1⅜″ to 11/16″, seven passes, anneal.
11/16″ to ½″, three passes, anneal and overhaul.
½″ to number 2 B. and S., six passes.

Drop Forging Metals

A Description of British Practice. Part I.—Aluminium Alloys

By DROP FORGER

GROWING FIELD FOR NON-FERROUS DROP FORGINGS

An additional impetus has been given to this industry by the comparatively recent popularity of aluminium alloys. A considerable number of aluminium alloy drop stampings are now in constant demand, and as the complex properties and peculiarities of these alloys become more clearly understood, there is no doubt but that the industry will thrive proportionately. Aluminium alloys in the form of drop stamped internal combustion engine connecting rods are being used to an increasing extent, and as it is known that reduction in the weight of all reciprocating parts of such engines make for greater efficiency, it can be definitely asserted that it is only a matter of time before the drop stamping of non-ferrous alloys will constitute a very important branch.

IMPORTANCE OF TEMPERATURE CONTROL

Broadly stated, there is not much difficulty in the production of good stampings in duralumin, and the keynote to success is attention to detail, the most important of all being temperature control. The melting point of this alloy is rather less than half of that of steel, and as burnt steel stampings are far from unusual occurrences, it will be appreciated that there is great danger of the production of faulty duralumin stampings from this cause. Moreover, the range of temperature over which steel can be satisfactorily stamped is a large one, whilst that of duralumin is approximately 30° C. Again, as steel is always stamped at a visible red heat, it is only a matter of a little practice for the stamper to estimate accurately by eye the correct stamping temperature. With duralumin, on the other hand, it is quite impossible to estimate by eye the correct stamping temperature, as the process is performed at a temperature which is not visible to the eye.

TYPES OF FURNACE

As the whole success or failure of stamping this alloy is dependent upon accurate temperature control, it will be advantageous to consider first the question of the most suitable methods of heating the alloy. The first essential is, obviously, an accurately controllable heating furnace. This must be of the muffle type. Its construction is fairly straightforward. If a one-piece muffle is not obtainable, it is a simple matter to build one by using a large slab of firebrick for the furnace bottom, and ordinary fire bricks of medium thickness for the sides and roof. A firebrick door is also an advantage in assisting to the obtaining of the necessary uniform temperature from the front to the back of the furnace.

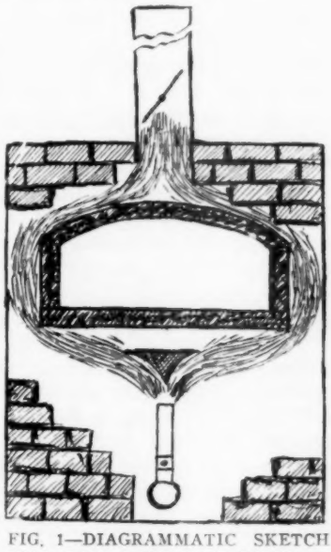


FIG. 1—DIAGRAMMATIC SKETCH OF A GOOD DESIGN OF FURNACE FOR HEATING DURALUMIN AND OTHER ALUMINIUM ALLOYS FOR FORGING

Electric source of heat is undoubtedly the best, but, as it is somewhat expensive and not usually met with in the drop forging shops, coal gas is probably the best substitute. An excellent arrangement is to have a number of gas burners, with a common cock, so arranged that they all burn exactly alike. These may be arranged all along one side of the furnace so that the heat travels up and over the muffle. This is probably the best arrangement, but some favor the burners being placed on both sides of the muffle. A further alternative lay out is to have the burners underneath the muffle and at right angles to the bottom of it. By suitable deflecting the flames it is easily possible to cause the heat to travel right round the muffle and so produce an even temperature throughout the whole furnace. This design is good, but it is slightly more difficult to build than those mentioned above. This arrangement is illustrated in Fig. 1. The dimensions of the muffle vary with the size of the work which is to be done, but a good average size is 14 ins. wide, 18 ins. long by 3 to 4 ins. high, and fitted with a close fitting door.

CONTROL OF TEMPERATURE

It is imperative that the temperature of the furnace be accurately controlled by means of pyrometers. These can well be of the ordinary base metal type, but it is preferable to have a two wire couple, as the type in which an iron tube takes the place of one wire of the thermo couple is usually too thick to register temperature quickly.

Of base metal couples, those composed of iron and eureka* or nichrome and eureka are satisfactory, but if only one or two couples are to be installed it is probable that the more expensive platinum and platinum-rhodium or platinum and platinum-iridium is worth while. These latter thermo couples are very accurate and at the temperatures to be met with in these furnaces will last for a very long time without the slightest detriment. So as to avoid undue lag, the sheath of such pyrometers should not be too thick, and so the customary robust iron tube is debarred. Silica sheaths, on the other hand, are too liable to be broken, hence a thin metal tube is advocated.

With easily controllable burners and a pyrometer it is a simple matter to control the temperature of a furnace; but it is evident that if the temperature of the furnace is not allowed to exceed the correct forging temperature of duralumin, it will necessitate much too long a time to enable the alloy to reach the essential temperature. In view of this, experiments are best conducted to ascertain the length of time necessary for the metal to reach the correct temperature when the furnace is at a specific temperature. This is simply arrived at, and with the somewhat crude assistance of other methods of estimating the temperature of the metal, there is no need to suffer loss owing to overheating of the metal. The crude methods referred to are customarily employed by most men who work these alloys, and they consist of estimating the temperature by noting the charring effect on splints of wood or paper. Whilst this method is obviously crude, it can be made reasonably efficacious when used in conjunction with a pyrometer, provided that the same sort of wood or paper, and in the same condition, be used.

CONSIDERATIONS IN STAMPING

Considerable attention is given to the essential methods of heating the metal or stamping, for the reason that it is

*This is a copper-nickel alloy of about 58% Cu.

a different matter to train stampers to use temperatures which they cannot see. Furthermore, overheated metal cannot be put right by any method short of remelting, for the reason that when overheated the lowest melting point constituent melts and irretrievably spoils the remaining metal. Again, it must be borne in mind that all auliminium alloys are particularly good conductors of heat, and for this reason it is difficult to decide how far one end of a bar has reached too high a temperature; hence, it is not easy to cut off the overheated portion of a bar and be certain that the remainder is not spoilt similar to the discarded portion.

The actual stamping of the alloy is effected in the same manner as in the production of steel stampings, excepting that it is not advisable to stamp the alloy so intensively at each blow as is done with steel. A large number of blows of small magnitude is much preferable to a few hard blows, which latter tends to break up the alloy.

DESIGN PROBLEMS

Duralumin does not flow so readily as does hot steel, and, for this reason, it is advisable to design the dies so that sudden changes of section are avoided. Similarly, it is somewhat difficult to make the alloy flow into sharp impressions, which necessitates all corners and angles being given as large a radius as possible. In the stamping of connecting rods, for example, it is preferable to blend gradually the center portion into the big and small end portions as much as possible. "H" section rods can be produced with a fair amount of facility; but a round or oval section is better.

This point is liable to be lost sight of to some extent, but it is well to remember that the strength of duralumin per unit of weight, as distinct from unit of area, is very high, and because of this a considerable increase in the section of a duralumin stamping is allowable, especially when they are to replace steel stampings. This is obviously the cause of slight increase in cost, because duralumin is an expensive alloy. An illustration of this may not be out of place. It is common knowledge that aero engines must be as light as possible per horse power. In one case, every possible component was lightened to the least possible degree, and every possible means were adopted to reduce the weight per horse power to a minimum. The expedient of utilizing a forged duralumin crank case instead of the customary casting was tried with excellent results, this enabling the designer to reduce the overall weight very considerably, without in any way sacrificing strength or efficiency.

DIES

If dies are to be designed expressly for the production of duralumin stampings, slightly less allowance should be made for expansion. Therefore it follows that if stampings are made in duralumin in dies which were designed for steel stampings, they will be slightly on the large side. It is true that the coefficient of expansion of duralumin is approximately twice that of steel, but to balance this the temperature of forging duralumin is only about half of that of steel. As duralumin does not flow so readily as does steel, it is advisable that the allowance for draw be slightly increased in those dies made especially for light alloy stampings.

"USE"

With some design of stampings it is possible to stamp direct from rolled or forged bar. This is accomplished by simply holding a length of bar in a pair of tongs and placing the other end on the bottom die. When this stamping is completed the thin rag is broken off, and the stamping of the next item is proceeded with in precisely the same way. This is continued until the whole length of bar is used up. With other designs of stamping, however, this is not possible for the reason that the shape of the item may be such that it would not be possible to make the metal flow into the dies by simply placing a round or square bar on to the bottom die and stamping it. If, for example, a stamping of a "U" shape be required, it would not be satisfactory to stamp it off the bar, partly because it would be exceedingly difficult to make the metal flow into the two vertical arms of the "U," and, furthermore, because it would waste too much material which would have to fill up the entire space between the two arms.

To overcome these drawbacks it is advisable to first forge a portion of the alloy into a shape which is approximately the same shape as the final stamping is to be, and this preliminary forging is generally known as a "use" in the stamping trade. With a stamping similar to the example quoted above, it is evident that if a piece of bar slightly larger than the section of the stamping be taken and simply bent to form a rough "U," it will be a simple and rapid matter to stamp it into its final shape in the dies. Such a procedure will save time and expense. It will also necessitate the employment of considerably less material.

In the same way as a "use" is made for steel stampings of some designs, so is it advisable to make the same for light alloy stampings. The method of forging these is important, because if they are forged down with heavy blows under a heavy steam hammer, the probable result will be that the metal will be split. Especially is this so when there is a large reduction from the bar to the section of the "use." It is further necessary to mention that if there is any small flaw produced in aluminium alloys, there is no chance of their being welded up in the subsequent forging or stamping, as is often possible with mild steel at a high temperature. Once a flaw has been produced, it will develop. If, therefore, a small flaw or lap is accidentally produced, it should be immediately cut out before further forging or stamping is performed.

HEATING AND LUBRICATING DIES

It will be evident that the temperature of the stamping will soon fall after it has been removed from the furnace, hence it is necessary to do as much work as possible immediately the stamping operation is commenced. The half finished stampings should be constantly reheated when their temperatures falls, and to aid in the conservation of the heat, it is a good plan to warm through the dies prior to commencing stamping. This is conveniently done by placing hot pieces of steel on the face of the dies for half an hour or so.

The dies may or may not be lubricated during stamping. There is no scale formed due to the oxidation of the metal, such as occurs with steel, hence the usual compressed air is not necessary. But with complicated dies, where there is a tendency for the stampings to stick, a little application of a lubricant is helpful. Various substances are used to effect this lubrication, but the common thin mineral oil is not to be recommended, because it has a somewhat peculiar effect on the alloy. It tends to produce a flaky surface, which tends to become freed and then restamped into the stamping in turn. A thicker material, such as soft soap or tallow, is preferable, and in some cases a dusting with talc is effective.

If lubricant is to be dispensed with altogether, the finish of the dies should be as smooth as possible. To do this is expensive, because it necessitates a lot of hand work; but when there are to be a lot of stampings produced from one pair of dies, it is probable that the extra expense involved in the hand polishing is justified.

This article will be continued in an early issue.—Ed.

Reclamation of Foundry Sands

Methods Practiced at the Ohio Brass Company. An Address Read Before the Quad City Foundrymen's Association, Moline, Ill., January 25, 1926

By A. A. GRUBB

Director of Laboratories, Ohio Brass Company, Mansfield, Ohio

Many foundries have for years used portions of runway sand in core sand mixtures and have returned quantities of such sand to molding floors to be reused. Several years ago Walter M. Saunders operated molding floors in a Providence, R. I., foundry on rebonded refuse sand alone and obtained good results. In general, however, the reclamation of foundry sands has not been successfully or economically carried on by foundries until within the past two or three years. This was due, not to lack of ability to rebond and restore the sand, but rather to lack of adequate means of measuring the important physical characteristics of the heaps and maintaining the proper values. The work of the American Foundrymen's Association Sub-Committee on Tests, under the able leadership first of H. B. Hanley and later of Dr. H. Ries, has in a large measure filled this need and we now have very effective methods of test designed to measure the working properties of sands. As a result, we are now able to reclaim much of the burned sand and floor sweepings which formerly went to the dump, and introduce them into our molding heaps without dangerously altering their characteristics.

CHARACTERISTICS OF SANDS

There are certain physical and chemical characteristics that distinguish good molding sand. The texture or grain size must be such as to produce the proper surface on the castings and yet permit the escape of mold gases through the sand. There must be sufficient bonding material or clay to bind the grains together into a more or less rigid mass capable of resisting the abrasive action and pressure of the molten metal. The composition of the grain must be such that it can stand the temperature of the molten metal without excessive fusion and the composition of the clay must be such that heat will not cause rapid deterioration of the bond.

An analysis of molding sand shows that it is composed of grain and clay. The grain is as a rule largely silica with small quantities of alumina, iron oxide and other impurities. The clay contains the same chemical elements, but arranged somewhat differently and in different proportions. The percentage of silica is somewhat lower while there are larger proportions of alumina, iron oxide and aluminum and iron silicates. Small percentages of organic matter, calcium, magnesium, sodium and potassium salts are also found and may be classed as impurities. In general they tend to lower the fusion point and perhaps decrease the durability of the sand. The silica and alumina are the most refractory constituents of sand.

Aside from the chemical composition the grain distribution and the physical condition of the material is highly important. The standard A. F. A. Fineness Test[1] prescribes a method for separating the clay from the grain and then screening the grain. The clay so separated is that material which is so finely divided or so light that, when suspended in water, it fails to settle out in a certain period of time. Material in such condition has radically different properties from material of the same chemical composition, but in larger particles. It clings together more readily, especially when mixed with a small proportion of water. This property becomes more evident, the smaller the particles. In coarse sand it is scarcely evident at all; in fine sand, 200 to 300 mesh, it is very noticeable, and in clay where the particles are from one thousandth down to perhaps a millionth of an inch in diameter, this sticky characteristic predominates. The bonding power of clays, then, may vary widely, not because of a difference in chemical composition, but through a difference in fineness of its particles. Some clays are made up largely of particles, but little smaller than a thousandth of an inch in diameter, while others are composed largely of particles only a tenth or hundredth as large; these latter are far more sticky and are much better bonding agents than the larger particles.

On account of its peculiar properties, this very finely divided material which is capable of remaining in suspension in water almost indefinitely, is called colloidal matter. It has great absorptive properties, especially as regards dyestuffs and advantage of this is taken in the A. F. A. Dye Adsorption Test[2] which serves as a measure of the quantity of colloidal material in a sand.

BOND STRENGTH

We are now in position to understand fairly well the mechanics of that very important working property of molding sand called bond or bond strength. Bond results in part from the surface tension of water in the voids between the sand grains and in part from the sticky clay or colloidal material in the sand. The force of surface tension is sufficiently great in fine sands, those of an average fineness of say 200 mesh, or higher, to permit its use in forming a mold, even though it contains no sticky clay. Upon drying such a mold, however, the bond almost entirely disappears and the sand easily washes with the molten metal or may even fall in before the mold is poured. Such sand is unsatisfactory for green mold casting, too, because the first molten metal dries out the water, destroys the bond, and allows the sand to wash. It is the sticky clay or colloid material that gives the sand that bond which is evident not only while the sand is green, but persists even after the moisture has been removed.

This colloidal clay has another characteristic which is of great consequence as effects the life of molding sand. Heat tends to burn the tiny particles together into larger aggregates or bodies which are no longer of colloidal dimensions and no longer have colloidal properties. Low temperatures, 200° to 250° F. effect them but little, if at all; at 600° F. there is marked deterioration and at 2,100° F. practically all colloids in sand are destroyed. It is this deterioration of the colloids that accounts for burning out of molding sand. Consequently, we find burned molding sand is low in colloidal materials and the process of reclamation is largely one of restoring them in proper quantity and kind.

The bond strength of molding sand is determined not

[1] See THE METAL INDUSTRY for December, 1925, page 493.
[2] See THE METAL INDUSTRY for December, 1925, page 494.

only by its clay content and its grain size, but also by the distribution of that clay. If the clay is merely mixed through the sand, low bond results; if coated uniformly on the grains, much higher bond is obtained. The writer has succeeded in more than doubling the strength of a given mixture of high and low bond sands by mulling for a period of time. This fact, too, should be kept in mind when attempting to reclaim spent sand by additions of clay.

There are several methods by which bond strength may be measured, each of which has its advantages and disadvantages. The tentatively adopted A. F. A. method[3] has been found satisfactory for control work in a number of foundries, but the writer considers it too slow and hardly sensitive enough for the purpose. H. W. Dietert of the United States Radiator Company rams up a cylindrical core of sand in a tube, removes the core and measures the compressive force required to crush it. The writer believes that a tensile test is the only true and direct measure of bond strength and so has devised a method for measuring the tensile strength of a standard specimen of sand in terms of ounces per square inch or grams per square centimeter. This method of measuring bond strength is more sensitive than the A. F. A. bar test, the latter giving results that are roughly proportional to the square root of the tensile strength.

PERMEABILITY

Permeability is another very important property of molding sand. By this term we mean its openness—the degree of freedom with which it will allow gases to escape. Permeability is determined largely by the grain size of the sand, and probably to a less degree by the uniformity of the grain, the clay content and the distribution of the clay. Inasmuch as the introduction of reclaimed sand into a heap is apt to change the average grain size of the sand and also perhaps the other characteristics which determine permeability, it is highly important that this property should be carefully controlled if reclamation work is to be successfully carried on. The A. F. A. Sub-Committee on Tests has developed a very simple but effective outfit for measuring permeability.[4] The outfit and method of test is fully described in the booklet. "Tentatively Adopted Methods of Test," published by the American Foundrymen's Association.

CLAY CONTENT AND DISTRIBUTION

Clay content is a very important factor in determining working properties of molding sand. Clay absorbs great quantities of water and when a heap contains excess clay over that actually necessary to produce the bond strength required for the work, that clay not only tightens up the sand, making it less permeable, but also requires excess water to bond it; when the molten metal comes in contact with the sand, the water is, of course, changed to gas which must escape if a perfect casting is to be produced. Thus excess clay is frequently responsible for blown castings. Furthermore, if the clay is not uniformly distributed through the sand, if it exists in the form of clay lumps or pellets, serious results occur. These pellets absorb large quantities of water and when the hot metal strikes them they explode, forming rough spots or scabs on the castings. Such a condition can be prevented by using less clay and distributing it better through the sand.

The maintenance of proper sand characteristics is, then, not merely a matter of sand additions. It is a difficult matter to put bonding material into refuse sand or into a sand heap and distribute it over the surface of the grain. The general practice, so far as molding heaps is concerned, is to add sufficient quantity of well bonded sand to maintain bond even though the clay is not well distributed, and discard to the dump enough floor sweepings, burned sand, etc., to maintain proper volume of the heap. There is really an excess of clay in the heap over that which would be required to give the necessary bond if it were properly distributed. The type of sand cutter generally used today does not help this condition. It is designed to mix sand and toss it into a pile, but it accomplishes very little, if anything toward distributing bond on the grain surfaces. If some engineer or manufacturer could develop a machine which would accomplish this and while working on the sand as it lies on the molding floors, it would be a boon to the foundry industry and the machine would deserve a wide market.

The sand that is discarded is usually not bad material. Part of the original clay, sometimes as much as half or even more of it, is still present and in good condition. Some of it, however, has been dehydrated and burned into brick-like material, which now appears either as dark irregular shaped fragments or as bonding material cementing some of the smaller grains together into aggregates or composite grains. If we wash the clay out of burned molding sand we find two types of grains, the clean silica and the composite grains, both of which can be easily recognized under a lower power microscope. In order to reclaim such burned sand it is necessary to add new clay and distribute it over the surfaces of these grains.

SPECIAL ADDITION MATERIALS

Several types of clay or bonding material for use in reclaiming burned sand are available. Some materials especially prepared for the purpose contain from 60 to 80 per cent of clay, the rest being ordinary silica grain. The writer has had very good success using high bonded molding sands for the purpose; molding sands containing from 30 to 40 per cent of clay are readily obtainable. They must, of course, be used in larger proportion than those materials richer in clay. The screen analysis and dye adsorption tests afford information from which to judge bonding materials. The grain should be of such size as to help offset the tendency of the sand heaps to become too tight or too open, whichever it may be. The higher the dye adsorption value, the stickier is the clay and the less of it will be necessary in the sand heaps. Some advantage in mixing may be obtained by air drying the bonding material and then grinding or crushing it in a dry pan or muller.

CARE AND PRECAUTIONS

The quantity of clay added to rebond the burned or refuse sand should be carefully controlled. Excess clay over that actually necessary to maintain the bond only increases chances for loss.

The clay should be thoroughly mixed with the refuse sand. In fact, more than mere mixing is desirable. A blade mixer or sand cutter accomplishes little toward distributing clay over the sand grains; this can be best accomplished in a muller or pan mixer. The sand should be properly tempered in the mixer and mulled for five or ten minutes.

It is highly important that the physical characteristics of the molding heaps be carefully watched when reclaimed sand is used. This presupposes knowledge regarding the permeability and bond values best suited to the type of work being cast, and this knowledge can be gained only by making regular and frequent tests on the heaps and by correlating this data with the detailed loss records of the heaps. When once that permeability value has been

[3] See THE METAL INDUSTRY for March, 1925, page 99.
[4] See THE METAL INDUSTRY for July, 1925, page 277.

determined which gives a minimum of blown and misrun castings and that bond value has been found that produces least dirty and sand cut castings, then these values should be maintained.

I do not mean to infer that there are not conditions other than low permeability of the sand that causes blown and misrun castings or conditions other than low bond that cause dirt and sand cuts. Such losses may be, and often are, caused by improper moisture content, too hot or too cold metal, by improper ramming or other causes, but so far as the sand is concerned, there is for every job an optimum permeability and an optimum bond value, and chances for loss are decreased by determining these experimentally and then maintaining them.

When burned sand is reclaimed and returned again and again to the heap, a change in grain size is apt to result and a corresponding change in permeability and bond occurs. Under certain conditions—when excess clay is used particularly—there is a tendency to tighten up the sand without a corresponding increase in bond. Under other conditions, the average grain size may become larger, the permeability will increase and the bond will drop. If castings are cored and the core sand is coarser than molding sand, the burned core sand which mixes with the molding sand tends to coarsen it. Any tendency for the heaps to tighten up or become more open should be offset by the addition of coarse or fine sand, as the case may be.

SAND CONTROL AT THE OHIO BRASS COMPANY

Now just a few words about how we operate our sand control and reclamation at The Ohio Brass Company. The floors and gangways of the brass foundry are swept each evening and the sweepings are put over a twenty mesh screen. Metallics are recovered from the oversize material by means of a ball mill and Diester table while the undersize is rebonded in a Simpson muller and returned to the molding floors. Each molding heap, of which there are forty in the brass foundry, is tested for bond and permeability periodically—some of them every day, others only once or twice a week, as experience indicates the need. These tests are made in the foundry by the man who makes the sand additions. Each week three floors are sampled and tested in the laboratory for clay content and grain size. The average grain size is calculated for convenience in comparing results. The sand additions are made up according to the requirements of each heap. They are composed of 70 to 90 per cent refuse sand, 3 to 15 per cent high bond sand, and the remainder new molding sand. The refuse sand is considerably coarser than our heap sand, due partly to burned core sand, so we find it necessary to use some new fine sand in order to maintain proper grain size. The bonding sand contains about 30 per cent sticky clay and is used only in sufficient quantity to maintain a clay content of 6 to 8 per cent in the heaps. Batches of sand are made up in the bucket of the loader which delivers them to the muller. Water is added and each batch is mulled at least five minutes; longer, if possible. The rebonded sand is then delivered to the heaps and cut in by hand. In case the molder keeps his floor clean and loses very little sand, the bond sometimes drops while little if any addition of sand is required. In such a case we actually take sand from his floor, rebond it and return it to the heap.

The system outlined above has proved very successful, so successful in fact that we are extending it to sixty molding floors in our malleable iron foundry. Not only has there been a marked reduction in sand costs, but there has been a great reduction in molding losses, which can be credited in part at least to the control exercised over the molding sand characteristics. Following are sand cost and foundry loss figures for our brass foundry since 1922:

YEAR	SAND COST PER TON OF CASTINGS	FOUNDRY LOSS
1922	$1.00	8.5%
1923	1.00	8.4%
1924	.40	4.2%
1925	.20	4.0%

The sand cost figures cover material only so to those for 1924 and 1925 should be added the labor involved and overhead on a muller and testing equipment. One man handles this work for forty molding floors. So the sand reclaimed more than pays for the expense involved and also gives us the benefits of control and the resulting reduction in losses as clear gain.

Casting Bronze Bars

Written for The Metal Industry by W. J. REARDON, Foundry Editor

Q.—We understand that there is a company making bronze bars 1 in. in diameter and about 12 in. long in either a permanent mold or centrifugal. Won't you kindly let us know who does this work or how it is done?

A.—We know there have been some bronze bars made in carbon molds. The carbon blocks are machined out, the same as you would a core box. Only instead of using a pin to hold the two halves together, they are made male and female. And the thickness of the block for a 1 in. bar would be approximately 2 in. by 4 in. each half, like sketch, and the side is bound with an iron strip so as to hold the carbon and keep it from breaking, thus preserving the mold in the foundry. This process makes nice bars.

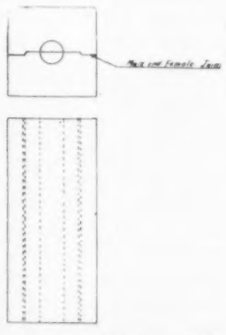


FIG. 1. MOLD FOR SINGLE BAR

We think, however, for production, the centrifugal method would be much better and cheaper if you can use the quantity it would produce. We have had some experience with centrifugal molds and can see no difficulty in producing them on a machine similar to sketch. Some people make bars for forged brass in a similar machine.

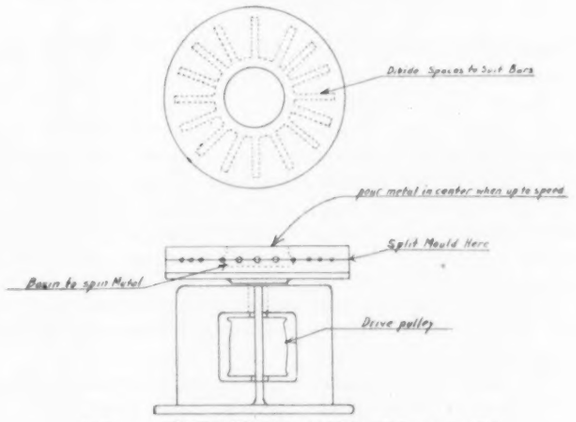


FIG. 2. CENTRIFUGAL MOLD FOR 16 BARS

British Institute of Metals

Abstracts of the Papers Read at the Annual General Meeting in London, England, March 10-11, 1926

NOTE ON THE SOFTENING OF STRAIN HARDENED METALS AND ITS RELATION TO CREEP

By R. W. Bailey

The author suggests that the creep of a metal under stress is the necessary accompaniment of the softening or reduction by thermal influence of a strain hardened condition and its simultaneous recreation by further slip or strain. Thus, for example, it is suggested that under a given stress the rate of extension of a piece in tension is determined by the rate of softening, which in turn depends chiefly upon the temperature.

The softening characteristics of strain hardened metals are examined and it is shown that there is good reason to believe that generally the mechanism of softening is a definite characteristic of a metal uninfluenced by temperature except as to the rate of its progress, and, further, that it takes place at all temperatures. The law of softening is represented by a formula.

The author indicates that, neglecting the variation of the physical properties with temperature, which is of only secondary importance compared with the influence of temperature upon the rate of softening, a similar law would be expected to connect the life and temperature of a piece subjected to a given stress.

NOTE ON THE CORROSION OF AN ANCIENT TIN SPECIMEN

By Professor C. O. Bannister

This note contains the results of the examination of an ancient tin sheath, the metal portion of which contained 99.98 per cent tin. The metal was covered with a corrosion product which contained 76.82 per cent tin and 5.1 per cent combined water. On driving off this water by heating in air the product showed a loss of only 0.59 per cent, indicating that it had gained 4.51 per cent oxygen. These results show that the product contained hydrated stannous oxide 43.35 per cent and anhydrous stannic oxide 54.68 per cent. The mechanism of corrosion of metallic tin therefore comprises the formation of hydrated stannous oxide and the subsequent oxidation and dehydration of this compound to stannic oxide.

SOME EXPERIMENTS ON THE SOFT SOLDERING OF COPPER

By T. B. Crow

The paper deals principally with the interfacial effects which arise between soft solder and copper when the latter is soldered under conditions which do not represent industrial practice—the author's contention being that the effects observed and recorded in a series of photo-micrographs are simply "enlargements" of those which would occur under industrial conditions; and that his method of experimenting is a convenient device for studying effects which may be ultra-microscopic under ordinary soldering conditions.

The photo-micrographs show evidence of having been prepared with great care. The interfacial effects are most strikingly shown—a region which in many existing photo-micrographs is little more than an out-of-focus blur. A number of experiments upon matters which arose from a study of the microstructure, viz.: (1) the solution of the copper by the "solder," (2) the effect of pressure (applied during joining) upon the structure and mechanical properties, (3) the identification of the interfacial alloys is described.

THE DETERMNIATION OF ZINC OXIDE IN BRASS

By B. S. Evans and H. F. Richards

A description of a method for the determination of zinc oxide in brass based on the fact that the back reaction, $Zn + H_2O = ZnO + H_2$, which occurs when an attempt is made to estimate zinc oxide by Archbutt's method for estimation of oxygen in copper (Analyst. 1900, 25, 253), can be suppressed by the presence of sufficient copper to combine with the zinc volatilized from the sample. The estimation is carried out in the same apparatus and in much the same manner as for determination of oxygen in copper, but that part of the furnace tube which is not occupied by the boat is packed with tightly rolled copper gauze. The copper gauze is deoxidized by prolonged heating in a current of hydrogen, the furnace is then allowed to cool the sample (a lump of about 80 grammes) introduced, the packing replaced, and after sweeping out the air with hydrogen the furnace is heated up to 980° C. and kept at this temperature until the rate of gain in weight of the phosphorus pentoxide U tube has dropped to that of a predetermined blank. The water evolved is estimated by the gain in weight of the phosphorus pentoxide U tube after deduction of the blank. Owing to the small amount of oxide which occurs in brass somewhat elaborate precautions have to be taken to reduce the blank to a minimum, these involve additions to the purifying train and measurement of the amount of hydrogen passed.

CRYSTAL GROWTH IN RECRYSTALIZED COLD-WORKED METAL

By W. Feitknecht

The experiments described in this paper deal with the changes of structure in cold worked metals after recrystallization is completed. They were mainly carried out with pure commercial aluminium (99.6 per cent), but some work was also done with very pure aluminium (99.98 per cent) and pure assay silver.

An endeavor is made by the author to explain the observed facts by assuming that the crystals formed during recrystallization were still strained, and that on heating further the least strained crystals absorbed the crystals having the most remaining strain.

THE INTEPRETATION OF THE MACROSTRUCTURE OF CAST METALS

By R. Genders

The interpretation of the structure of cast metals and alloys has depended mainly on empirical observation. While in the case of steel the macrostructural characteristics of a casting give definite information regarding casting conditions, the same indications cannot be applied directly to cast specimens of non-ferrous alloys, particularly to those consisting largely of copper, which solidify rapidly. The work described has the aim of establishing grounds upon which a more general interpretation of the macrostructure of metals, and consequent knowledge of the mechanism of the solidification of a casting, can be based. In copper alloys of high thermal conductivity,

solidification occurs concurrently with pouring and the flow of metal within the mold becomes of primary importance in governing the mode of crystallization. Experimental slab ingots 12 x 6 x 1 inch were made of two alloys of similar physical characteristics, but of different color, melted in separate crucibles. By the use of a specially designed pouring-trough the metal passed into the mold in an unbroken stream while the alloy comprising the stream could be changed at any prearranged stage by varying the amounts of metal in the two crucibles. The disposition of the color zones distinguishable on sections from the ingots indicated that the process of formation of the ingot from the stream was one of continuous displacement of metal in the path of the stream to the faces of the mold. Several sets of casting condition, covering most of those used industrially, were included in the experimental work. The conclusions drawn concerning the mechanism of the formation of a casting, permit of the interpretation of many peculiar features observed in the structures of ingots of copper alloys.

The method for determining the mode of formation of the casting by the use of two alloys is applicable industrially in connection with the design of molds and casting methods.

THE HARDNESS OF COLD-ROLLED COPPER

By Samuel L. Hoyt and T. R. Schermerhorn

Hardness tests of two series of cold-rolled copper bars are reported in detail, one which had received a 2 per cent and one a 10 per cent reduction in thickness per pass. These confirm the old or "conventional" form of relationship between the degree of working and the hardness. In neither case did the authors find either the anomaly noted by Alkins (the "Alkins effect") or the reversal noted by Rawdon and Mutchler. However, they do believe that they have observed a well-pronounced Alkins effect on another series with heavier reductions, not recorded here. The deviations from a smooth curve which may be seen on the hardness curves may be accounted for as due to unavoidable experimental errors. The draft per pass had only a subordinate effect on the hardness, but, in the two cases reported in detail, the 10 per cent reduction have a greater increase in hardness than did the 2 per cent reduction per pass.

The hardness over the cross section was found to be uniform for reductions above 20 per cent. At the start, with small reductions, the authors found the top surface to be harder than the side of the test-bar. This difference disappeared at about 10 to 20 per cent reduction.

THE INFLUENCE OF GASES AT HIGH TEMPERATURES—PART I

By A. Glynne Lobley and Douglas Jepson

The paper describes briefly a special type of electric resistance furnace, in which the resistor is a plain carbon tube mounted vertically in water-cooled electrodes. The furnace can be evacuated, or filled with any desired gas, and an arrangement is provided by which a crucible containing the metal under treatment can be lowered from the heating zone into a water-cooled compartment, thus giving a very rapid and reproducible rate of cooling.

Electrolytic copper was heated in atmosphere of nitrogen, hydrogen, and carbon monoxide, respectively, to various temperatures between its melting point, 1,084° C., and its boiling point, 2,310° C., being kept at the given temperature for a period of 30 minutes. The metal was then cooled rapidly in the manner stated, and examined for blowhole volume, hardness, and macrostructure.

It was shown that nitrogen and carbon monoxide are not absorbed by molten copper up to temperatures of 1,900° C. and 1,700° C., respectively, in excess of that soluble in the solid metal. Hydrogen, on the other hand, is absorbed to a varying degree at all temperatures up to approximately 2,200° C., and the excess over that soluble in solid copper is ejected on solidification forming blowholes. The amount of gas thus held appears to bear a definite relation to the solubility of the gas at the temperature under consideration. The blowhole volume-temperature curve falls from the molting point to a minimum at approximately 1,350° C., rising to a maximum at 1,750° C., then falling as the temperature rises to approximately 2,200° C.

RESEARCHES ON THE NATURE, PROPERTIES AND CONDITIONS OF FORMATION OF INTERMETTALIC COMPOUNDS WITH SPECIAL REFERENCE TO CERTAIN COMPOUNDS OF TIN—PARTS I-V

By W. Hume-Rothery

Part I. The theoretical proof of the Phase Rule is discussed.

Part II. In contrast to other compounds, intermetallic compounds conduct electricity.

Part III. A true compound is not present in the β solid solutions of copper, silver and gold alloys, but these phases approximate to the compositions Cu_5Sn, Cu_3 (or Ag_3) Al, and Cu (or Ag, or Au) Zn.

Part IV. The freezing point diagram of the system calcium-tin is determined.

Part V. The freezing point diagram of the system magnesium-tin is determined.

THE BRITTLE RANGES OF BRONZE

By W. L. Kent

The brittle ranges of cast and annealed bronzes containing up to 25 per cent of tin were investigated, using the Izod impact test in the manner employed by Bunting,* and the results correlated with the known facts concerning the workability of the alloys.

It was shown that alloys in the α range were brittle at high temperatures, whilst those containing the $\alpha + \delta$ eutectoid, which are hard and brittle at ordinary temperatures, become softer and tougher above 520° C. due to the formation of β which takes place at that temperature. The maximum toughness occurred in the neighborhood of 600° C.—an observation which is in agreement with the results of different tests performed by other workers. The effect of annealing was to bring the alloys nearer to equilibrium so that the extent of the brittle range at ordinary temperatures was diminished.

DIE-CASTING OF ALUMINUM ALLOYS

By George Mortimer

From the utility standpoint one of the interesting attributes of the metal aluminium is the ease with which its alloys may be "die-cast." The economic value of die-casting in general is now widely admitted and need not be unduly stressed here. It is so generally recognized that the die-casting of brass and the bronzes have received close and costly attention of late, whilst in America at least one firm is successfully producing iron castings from permanent molds.

Neither in brass nor in iron, however, is the operation carried out with any of the specifications for aluminium casting alloys, nor do the molds cost so little or last so long. This fact, coupled with the designers' long experience of these alloys under all sorts of service conditions, has been one of the more active influences in the very striking developments which have taken place in the past decade, in the application of die-castings to engineering and industrial uses.

* Bunting. J. Inst. Metals, 1924, 31, 47; ibid., 1925, 33, 97.

A Rapid and Accurate Method of Analysis of Brass

Written for The Metal Industry by R. F. SMITH, Chemist, The Hoyt Metal Company of Canada, Ltd.

Having read the article by W. J. Pettis on a method of controlling the zinc contents of 60/40 brass in the March edition of THE METAL INDUSTRY, it has occurred to me that the following method, which is absolutely reliable, would be of some interest to chemists faced with the problem of making an analysis of brass, which has to be speedy and accurate.

The methods used in a large plant in England are as follows: The charge of about two to three thousand pounds would be in the furnace ready to be tapped. A sample is taken with a ladle and poured into a small flat iron strip mold. The chemist takes the sample with a pair of tongs, cools it in water, takes it to the laboratory and drills it. He then analyzes it, taking not more than five minutes, and then tells the foreman what to do, whether to add more spelter, and how much, or whether to stir some out

The charge is tapped into a kettle sunk into the floor, and the chemist takes another sample and repeats the above procedure before the men pour the charge. Obviously the chemist must be extremely quick, or the charge will solidify before they have finished pouring.

The composition of the charge was 61/39 brass, and was used for rolling into sheets, ½ per cent variation either way being allowed. A little new metal with the balance being made up of clippings, scrap, etc., was used for making up the charge.

Now as to the methods of analysis used. First of all a description of how the apparatus was placed might not be out of place, as a great deal depends on just how handy everything is. At the end of the bench nearest to the balance room is a burette containing 1-1 nitric acid, then the hot plate, the H_2O wash bottle, a double burette stand holding one burette containing ammonia and one containing acetic acid come next. Two flasks, one containing a starch solution and the other potassium iodide, are placed together with a 10c.c. graduated cylinder on the left hand side of a burette stand holding a burette, with an overhead feed, containing a standard sodium thiosulphate.

Solutions Required:

Nitric Acid .....One part of water to one part concentrated Nitric Acid.

Potassium Iodide .....One hundred grams of Potassium Iodide dissolved in 78 c.c. of water.

Sodium Thiosulphate...One hundred and thirteen grams of Sodium Thiosulphate dissolved in 8,000 c.c. of water and standardized against pure copper.

Method of Analysis:

Weigh out 0.2 gms. of sample into a 400 c.c. tall form beaker and cover with a clock glass. Dissolve in the smallest quantity of HNO_3. Boil off fumes, wash clock glass and sides of beaker with H_2O (using about 50-75 c.c.). Cool, make just ammoniacal and then just acid with acetic acid. Add 2.5 c.c. of KI solution and titrate with the standard sodium thiosulphate solution, using starch as an indicator. In titrating, the solution is run in until the yellow color just disappears, then add the starch and titrate until the blue color just disappears. This method is quite reliable and after a little practice a chemist can make the determination in three to five minutes.

It is absolutely necessary to see that everything is in readiness before taking the sample. Such little details as having the drill running, clock glass and beaker handy etc., make a great deal of difference when in a hurry.

Band Saw Speed

Written for The Metal Industry by W. L. ABATE, Brass Finishing Editor

Q.—What is the best speed at which to run a band saw for cutting brass and aluminum? How can I secure that speed? My main line shaft is 1⅜ in., line shaft pulley 12 in., drive pulley 12 in. What are the best saws to use for this purpose. I am now using 5, 6, 8 and 12 tooth saws; small saws, angle gullets and larger saws round gullets. Can small tooth saws, such as 10 or 12 be filed on a Wardwell saw file? What files give best results?

A.—You neglected to advise revolutions per minute of your line shaft; also diameter of the large driving band saw pulley at the bottom of machine. This large band saw pulley should run so as to give a speed of 3,000 feet per minute. If it is 36 in. in diameter, it should run about 340 r.p.m. If it is less than 36 in. it will have to run faster.

There is a variation of cutting speeds used in different shops ranging from 3,000 ft. to 4,500 ft. per minute, of the saw blade. Some of the body manufacturers are running saws with 6 points per inch at 6,000 ft. per min., for cutting sheet aluminum. This would not be good practice where sand is encountered as in a brass foundry.

We would suggest 3,000 ft. per minute, 7, 8 or 9 teeth or points per inch. Any filing machine will file these saws. The files should be of the ordinary kind, such as are used for wood saws.

Saws for metal do not have the hook tooth as do wood saws, but should have the round gullet or fillet at the base of the tooth when used on aluminum. The fillet prevents the metal from sticking and filling up the tooth.

To find the speed of your machine, find how many feet or inches are contained in your driving band saw wheel and divide 3,000 ft. or 36,000 inches by your wheel dimensions.

Hardness of Plated Metals*

One of the most important and remarkable discoveries as regards deposited metals is their extreme hardness. That is why they are being used with so much success in the building up of worn machine parts. The hardest nickel that can be produced in the ordinary way is about 200 Brinell, but deposited nickel shows a value of 400 Brinell.

Chromium is still more remarkable, for while metallurgically produced chromium equals 500 Brinell, electrolytically deposited chromium is so hard that it cannot be touched by a file; hence the value of chromium faced plates for printing, etc.

* From discussion of this subject by D. J. MacNaughton before a meeting of the Electroplaters' and Depositors' Technical Society on December 9, 1925, in London, England.

Testing Materials Society Meeting

Group Meetings of The American Society for Testing Materials Committees at the Providence Biltmore Hotel, Providence, R. I., March 17-19, 1926

The fifth group meeting of the committees of the American Society for Testing Materials was held at the Providence Biltmore, Providence, R. I., on Wednesday, Thursday and Friday, March 17, 18 and 19, 1926, in which 13 committees took part.

In addition, meetings were held of the Joint Research Committee of the A. S. T. M. and the A. S. M. E. on the Effect of Temperature on the Properties of Metals. The meetings were attended by about 350 members and guests representing the various industries concerned, such as the producers of non-ferrous metals, the electrical industries, and others, and including representatives of the railroads, public utilities, Federal government, etc.

Due to the careful planning and the activity of this Local Committee the group meeting was carried through with extreme smoothness and was considered by many in attendance as one of the most successful yet held.

CORROSION OF IRON AND STEEL

Committee A-5 held a meeting well attended by members and visitors.

Co-operative Tests have been instituted with Lloyds' Register of Shipping on the corrosion of certain classes of rivet and plate combinations in the form of riveted sections, including wrought iron and copper-bearing and non-copper-bearing steel.

Tentative specifications for galvanized (zinced) sheets for various classes of service, and for certain classes of wire and wire products have been developed. Some suggestions have been formulated to serve as a basis for specifications for galvanized (zinc) coatings for pipe. This is receiving further consideration.

A co-operative study is being made in four laboratories of several accelerated methods which are intended to be used to parallel atmospheric exposure results, particularly upon galvanized (zinc) coated products. This is a preliminary study to select the preferable methods to be applied in conjunction with and paralleling the elaborate program of exposure tests now getting under way. Material progress has been made, and there have been eliminations of some methods of little proven value.

The program of field tests of metallic coated products, mentioned above, is almost ready for an actual beginning of tests at the five locations—Sandy Hook, N. J.; State College, Pa.; Pittsburgh, Pa.; Altoona, Pa., and Key West, Fla. The test racks have been practically completed and much of the material for test has been assembled for distribution. The close interest and co-operation of industry is reflected in the intensive effort and expenditure of time by committee members, and by the liberal contributions of money and materials needed for the comprehensive series of tests outlined by the sub-committee.

Committee A-5 has active co-operative relationships with important corrosion investigations in progress under the guidance of other special technical organizations, and it is sponsoring the formulation of specifications for zinc coatings as applied to a wide range of products.

Arrangements have been made by which the specification and methods of testing work of the committee will be closely co-ordinated with the work of the Sectional Committee on Zinc Coating of Iron and Steel recently organized under the sponsorship of the A. S. T. M. and functioning under the rules of procedure of the American Engineering Standards Committee. Specifically, Technical Committee VII, of the Sectional Committee, to which has been assigned the development of methods of test of zinc coatings will also serve as the sub-committee on this subject of Committee A-5. In this way a much needed and urgently demanded standardization project in the field of zinc-coated articles bids fair to emerge from what has heretofore been a situation of unco-ordinated effort in the development of standards for zinc coatings.

COPPER WIRE

The principal item under discussion at the meeting of Committee B-1 on Copper Wire, was the admission to membership on the committee of representatives of various bodies interested in copper wire in order that the committee might be approved as a Sectional Committee on Copper Wire functioning under the rules of procedure of the American Engineering Standards Committee. This enlargement in personnel and sectional committee organization has now been effected. The several specifications for copper wire which cover medium hard-drawn wire and hard-drawn wire were reviewed with the thought of presenting these to the A. E. S. C. for adoption as American standard. The revision of all copper wire specifications is contemplated which will give the unit weight in terms of density rather than specific gravity. When the specifications are finally adopted by the A. E. S. C. there will be one universal standard for the materials in question throughout the country.

It was decided to specify resistivity in the Specifications for Bronze Trolley Wire in the terms of lb. per mile ohm in place of the present units of ohms per meter gram. This will make all wire specifications consistent in this respect, the change having been made at the suggestion of the American Electric Railway Association with which association the committee has been in constant communication in an attempt to arrive at uniform standards.

NON-FERROUS METALS AND ALLOYS

At the meeting of Committee B-2 on Non-Ferrous Metals and Alloys, five new specifications were presented and accepted for submission to the society at the next annual meeting. These include Aluminum Bronze Castings, Steam or Valve Bronze, Composition Brass or Ounce Metal, Alloy 88 Copper, 8 Tin, 4 Zinc and Aluminum Base Alloy Ingots for Sand Castings. The committee expects to present with its annual report in June a paper on "Light Aluminum Casting Alloys." This will be a companion paper to the one presented two years ago on "High Strength Light Alloys," which covered alloys in wrought form.

A new sub-committee has been authorized on gold and silver alloys. This committee is to take up as its first problem a study of silver solders with a special reference to composition and physical properties.

CORROSION OF NON-FERROUS METALS AND THEIR ALLOYS

Material progress was reported at a meeting of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys, on the co-operative series of tests in which the committee members are participating. These tests include spray test, immersion test, alternate immersion and electrolytic test on a number of alloys to determine the most suitable type of accelerated corrosion test. Thousands of specimens have been made and distributed and several laboratories have already completed the entire series. It now remains to review the immense amount of valuable data obtained and to make an analysis of this data for presentation by the committee at some future time. Plans are being developed for a further program of work for the committee.

EFFECT OF TEMPERATURE ON THE PROPERTIES OF METALS

Three sub-committees had previously been appointed to outline and estimate the cost of investigation of the effect of temperature upon chemical stability, physical and thermal constants, compression, and torsion. Reports were received from these sub-committees and these cost estimates will be used in setting up a proposed budget for these phases of investigation.

For the accumulation of service information concerning the success or failure of various metals in high temperature service, a questionnaire is being developed which will be distributed to various industries using metals under high temperature service conditions.

Notes on current bibliography were presented and are to be circularized to the committee members.

Nickel, Copper, Brass and Silver Solutions

Written for the Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Q.—I am a young subscriber of your magazine, and would appreciate if you would kindly answer the following questions:

1. What is the best formula for nickel solution used to electroplate auto parts, such as: brass head lights, rims, etc., also steel parts which are first copper plated?
2. Also formula for a good copper solution to plate steel parts, which require a good and heavy coating.
3. Formula for brass solution, used for plating cast-iron stove parts. The solution I have at the present does not give a bright brass finish; turns reddish. How can I better this solution, or is it best to make same new? What current strength is used to plate these stove parts in about 10 minutes?
4. What is the best solution to plate silverware and reflectors in silver? Is it necessary to have a silver-strike solution? Would like to make a silver solution for this kind of work, without giving same a strike, if possible. What current strength and time is required to give these articles a heavy plate? After plating, what kind of a wheel and what compound is used to color silver?

A.—We are pleased to answer your several questions as follows:

1. The following formula for nickel solution should answer for plating the materials you enumerate:

Water	1 gallon
Single nickel salts	12 ozs.
Nickel chloride	2 ozs.
Ammonium chloride	1 oz.
Boracic acid	2 ozs.
Epsom salts	2 ozs.

2. Copper solution:

Water	1 gallon
Sodium cyanide	5⅓ ozs.
Copper cyanide	4 ozs.
Bisulphide of soda	1⅓ ozs.
Caustic potash	½ oz.
Hyposulphite of soda	1/50 oz. (Or 10 grains)

Temperature 120 deg. F. at 4 to 5 volts.

To prepare the solution, dissolve the sodium and copper cyanide in one-third the water required at 140 deg. F., then add the balance of the water cold, then the soda factors in the order given.

3. Brass Solution: The following formula will give good results. Always add about ⅛ oz. sodium cyanide and 1/32 oz. bisulphite of soda per gallon of solution per day, when the solution is operated a full working day of 8 to 9 hours. This addition applies also to your copper solution. You will maintain standard results with such additions:

Water	1 gallon
Sodium cyanide 96-98%	7½ ozs.
Copper cyanide	4 ozs.
Zinc cyanide	1½ ozs.
Bisulphite of soda	2 ozs.
Aqua ammonia 26°	½ fluid oz.
White arsenic dissolved in caustic potash and 4 ozs. hot water. Arsenic 1½ grains; caustic 5 grains.	

Prepare the solution as given for copper; the sodium cyanide and metal cyanides first, then the balance of the water cold; other materials in the order given. Use cast anodes 80 per cent copper, 20 per cent zinc, voltage 4 to 5. To your present solution add 1 oz. sodium cyanide; 1 oz. bisulphite of soda, and ½ oz. caustic potash per gallon as a brightener; arsenic as above mentioned.

4. Silver Solution: If you want to eliminate the silver strike solution, then the silver solution for plating auto reflectors (which should always first be nickel plated with a flash deposit of nickel), will have to contain free cyanide largely in excess of the free cyanide carried in a normal solution. We give you a normal solution, but are sure it will be best for you to use a separate silver strike:

Water	1 gallon
Sodium cyanide	4½ ozs.
Silver cyanide	3 ozs.
Carbonate of potash	1 oz.
Ammonium chloride	⅓ oz.

Prepare the solution as outlined for copper. Voltage 1; amperage 5 to 10, depending upon the amount of free cyanide carried in solution. Time of deposit will have to be determined by you. To color buff, providing the silver deposit is soft, use a soft unbleached muslin buff or sheepskin buff, the buffing medium to be lamp black mixed with kerosene oil to a paste. Finish with a little jeweler's gold rouge mixed with denatured alcohol.

5. Silver Strike Solution:

Water	1 gallon
Sodium cyanide	6 ozs.
Silver cyanide	¼ oz.
Caustic potash	½ oz.

Voltage 6. Anodes hard sheet steel. Replenish with sodium cyanide and silver cyanide as required. For silver solution use pure sheet silver anodes.

A General Survey of Chromium Plating

Discussion of a Paper Read at the Meeting of the Electro-Platers' and Depositors' Technical Society, Held at the Northampton Polytechnic Institute (England)*

COMMUNICATION FROM DR. PFANHAUSER

The opinion is advanced by Mr. Ollard that Dr. Liebreich's process is at present the most satisfactory. I must refute this. It seems that in England, interested parties are not quite sufficiently informed as to contents and actual value of the Liebreich patents. In Germany, the conviction has already been gained that no real practical work is being done by using the Liebreich process. The principal patent of Dr. Leibreich in Germany (No. 398054, dated March 9, 1920) concerns a solution which remarkably differs from the solution today in general use in Germany, insofar as it must be free of chromic acid because otherwise a mixture of bivalent and trivalent chromium oxides which he claims in his patent, could not exist. As shown by the very elaborate work of Sargent, electrolysis with a fairly satisfactory efficiency of metallic chromium is only possible with an excessive amount of chromic acid in the solution. During each electrolysis of chromic acid naturally there develops chromium chromate *i.e.* besides hexavalent chromium. There is also trivalent chromium in the solution. Bivalent chromium is incapable of existence in the presence of hevavalent chromium as contained in chromic acid. As no real practical work can be performed in solutions without chromic acid, it is obvious that it would be impossible to work economically and practically according to Dr. Liebreich's patents if they were literally followed. Very detailed studies of Professor Muller, Dresden, who, jointly with the Langbein and Pfanhauser Werke A. S., has worked extensively on this subject, show that it is absolutly necessary to have a large surplus of chromic acid if satisfactory chromium deposits are to be obtained. During the electrolysis of chromic acid, no low valent chromium oxides need to be developed to enable the deposition of chromium metal on the cathode, but theoretical reflections show the view cannot be maintained that the intermediate formation of lower valent oxides of chromium on the cathode is the preliminary condition for the deposition of chromium. The solutions installed in Germany by my firm worked satisfactorily at once, which shows that it is not necessary to form first other lower oxides of chromium by electrolysis in order to deposit chromium. Further, in examining the efficiency of current in the case of chromic acid, we find that the electrolysis of the hexavalent chromium combination takes place directly as the theoretical efficiency of current points to an equivalent of 0.32 grams of chromium per ampere hour. The efficiency of current increases as the temperature decreases at which the electrolysis of the chromic acid takes place. It amounts to 15 per cent of the theoretical value at a temperature of about 40 deg. C to about 27 per cent at 20 deg. C., going up to about 40 per cent if the electrolysis takes place at 0 deg. C. The lower the temperature, the more hydrogen is bound by the deposited chromium, consequently the chromium deposits become correspondingly brittle. In the chromium solution of my firm, the following thickness of deposit is reached in one hour at temperature of 35-40 deg. C.,

At a C. D. of 5 amp. per sq. decimeter — 0.0037 min.

At a C. D. of 10 amp. per sq. decimeter — 0.0074 min.

Therefore, to deposit a coating of 1 mim. of chromium at the above mentioned temperature of the solution, it will require about 270 hours using a current density of 5 amps. per sq. decimeter or about 135 hours at a current density of 10 amps. Working at a temperature of about 20 deg. C., the respective times required, would be only about half.

The throwing power is very important. It has been found here that a good throwing power can only be had in a solution which permits deposition of chromium also when using lower current densities. The electro-chemist will understand this feature without further explanation. We have been successful in finding a solution with a comparatively good throwing power even when working without auxiliary anodes. Patents have been applied for in Germany; also in England and the United States. All chromium plating processes known so far (except Dr. Liebreich's if considered after the exact wording of his patent) are based on the principal patent of Dr. Franz Salzer No. 221472 and his additional patent No. 225769 dated 1907. Dr. Salzer also worked with a solution having a considerable surplus of chromic acid. This is in fact, the only solution that can be considered economical for practical work, because chromium solutions free of chromic acid have too high an electric resistance, so that it would be necessary to work with excessively high tensions in volts to reach the current densities required for chromium plating. We have obtained chromium deposits also on aluminum, zinc, etc., but would not recommend to chromium plate aluminum because sheets and other thin material become very brittle so that they cannot be worked after plating. Besides absolute adherence of the chromium deposits on aluminum cannot be guaranteed.

Exact costs of the process have already been determined by my firm as the results of considerable practical experience have been available for a sufficiently long time. In Germany, the cost of chromium plating by our process, plating time of one hour, amounts to 5 or 6 pfennigs per sq. decimeter exclusive of costs for grinding and polishing. This is higher than the costs for nickel plating, but the difference is minimized by taking into consideration the various preliminary and finishing operations. We are figuring in Germany, the cost for chromium plating generally about 50 per cent higher than nickel plating.

COMMUNICATION FROM DR. LIEBREICH

I do not know how Dr. Pfanhauser supports his view that in Germany no really practical work has been done by the Liebreich process, as there are already several commercial plants working this process today. As far as the difference of theoretical views are concerned, I consider that these are chiefly due to a difference in expression. Dr. Pfanhauser's view is that the deposition of chromium takes place directly from the chromic acid and not owing to a secondary reduction at the cathode. I, however, consider that this is not correct but that the reduction takes place in stages and have arrived at this view after having carefully made and studied the current-voltage curves independently and at about the same time as Sargent.

The investigations of Professor Muller are taken from some "legal technical advice" work which he has done for

* For an extended abstract of the original paper see THE METAL INDUSTRY for March, 1926, page '1 '1.

the Langbein and Pfanhauser Works and which they have not published. They have therefore, avoided open criticism but should the investigation be published, one might be able to test the present theories and see whether they have to be modified. If Dr. Pfanhauser, however, considers that the fundamental difference in his process from mine, is that the baths contain free chromic acid, he is mistaken. The electrical current will reduce chromic acid at once to lower oxides. The difference lies in the fact that Dr. Pfanhauser does not consider that under these circumstances bi- and tri-valent oxides are formed. He founds his view on the statement that bivalent oxides of chromium cannot exist in the presence of hexavalent oxide.

My view, however, is that the reduction in the vicinity of the cathode, which is the place in question, may go down to the bi-valent or tri-valent stage that is to say, there may be formed thin layers of bi- and tri-valent state which I would like to call "chromo-chromite." I have referred to this matter from a chemical point of view in my paper in Zeitschrift fur Elektrochemie, Volume 29, page 208, 1923, and described the evidence from which I deduce the exitsence of such oxides at the cathode. I have there shown that the interpretation that I have already given of the changes in direction of the current voltage curves fit the case. The theoretical view that bivalent oxides of chromium cannot exist in the presence of hexavalent is based on insufficient consideration of the data. In the first place, in all probability in the vicinity of the cathode only very few hexavalent ions will exist, and consequently it is probable that one is not concerned with the bivalent ions but with colloidally suspended oxide molecule which probably carries a charge. That the lower oxides of chromium produced by electrolysis consist appreciably of bivalent oxides has recently been conclusively proved by Professor W. Traube in a publication, Zeit. fur Anorganische und Allgemeine Chemie Vol. 147-50, 1925. I consider therefore, that Dr. Pfanhauser's view cannot stand against this important proof and my view is more in accordance with facts.

Dr. Pfanhauser is completely right in stating that my process requires the bath to be free from chromic acid, but all baths for the deposition of metallic chromium which are made up of chromic acid will contain, as soon as the current passes, lower oxides of chromium, and it is probable that the cathode layer, which is the part to be considered, will almost immediately become free from chromic acid. The reduction can be seen by the darkening of the solution.

However, this is not the only question; the point is, how far the reduction goes. If this is sufficient so that only bivalent or lower oxides occur in the bath, and if the conditions are such that they can persist, then the necessary requirements for continuous deposition of chromium are obtained. This condition can best be fulfilled if one employs a solution which has been previously reduced. One can, however, also begin from chromic acid and adjust the condition in such a way that these oxides are formed by the current and remain in the solution. Baths of this kind are the subject of my process as they are made up according to my master patent with reduced solution and are also subject to English patents.

Dr. Pfanhauser's error lies in the fact that he believes the composition of the baths at their preparation characterizes them. With chromium baths this is not so. The character of the chromium bath is given when the current passes. This is why Dr. Pfanhauser believes that his baths contain free chromic acid while actually, (although they are made up with free chromic acid) they are worked up in such a way that the lower oxides form. This is what I meant when I said that we mean the same but express it differently.

How far this difference of Dr. Pfanhauser's method of expression justifies his process, of which he learned the fundamental points during the time that we worked together, should be decided by some independent person, and there are questions which should be dealt with by another court than a scientific one.

DISCUSSION BY D. J. MAC NAUGHTON, RESEARCH DEPARTMENT, WOOLWICH

It may be as well to point out to members that the solution, the formula for which the secretary had just read out from the American letter circular, as being used by the U. S. Bureau of Standards for printing plates* is under suspicion of infringing one or the other of the patents out, but certainly at the present time, it appears that the only chromium plating bath of any practical importance consists of a solution of chromic acid to which small additions of chromium salts have been added. Chromic acid alone is unsuitable. The precise nature of the cathode reactions, as the author states, is, at present obscure.

One of the chief disadvantages of this bath consists in the low efficiency of deposition. The author states that at a current density of 200 amps. per square foot, the efficiency amounts to 30%, the balance 70% being wasted upon hydrogen production. This 30% represents the current which is devoted to reduction of chromic acid to chromium. In chromic acid the chromium is hexavalent, so that the current required for the production of metal is three times as much as is required for the reduction of bivalent salts, such as those used in metal plating. Thus even with an efficiency of 30%, the yield of metal is only 1/10 gramme of chromium per amphour, which is only about 10% of that obtained in the deposition of nickel.

This yield of 1/10 grammes per amphour is obtained at 20° C., with 200 amps per square foot of cathode surface, and these conditions would secure a blue-grey type of deposit. Deposits of this type have a Brinell hardness number of 500-600 and can just be touched with a file.

Mr. Ollard refers to the bright type of deposit and suggests that the conditions for satisfactory commercial production have not been definitely fixed. If the temperature of the solution is raised to 40° using a current density of 200 amps. per square foot, bright deposits could be obtained. Unfortunately the efficiency at the higher temperature is much lower and only secures a yield of about .05 grammes of metal per ampere hour. These bright deposits are extremely hard, and cannot be filed.

With reference to the internal stress of chromium deposits. This we have found at Woolwich to be considerably greater than that of nickel deposits. The importance of securing adequate adhesion to the basis metal to prevent the deposited metal from splitting off is thus evident.

In conclusion, although there are obvious limitation at present, chromium plating has already proved of serious importance in view of the unique properties of the deposit.

DISCUSSION BY G. E. GARDAM, RESEARCH DEPARTMENT, WOOLWICH

In chromium solutions, the solution has appreciable resistances to the heavy currents passing, the cathode potential or polarization does not vary much with current density, and there is no diffusion polarization owing to the violent agitation by the hydrogen evolved. The chief reaction taking place at the cathode and according to one theory, the only reaction is the evolution of hydrogen, and this is occurring at a high current density, say 200 amps. per square foot, a diminution to 20 amps. per square foot does not, therefore, affect the cathode potential much. Moreover the current efficiency varies

* See THE METAL INDUSTRY February, 1926, page 69.

very rapidly with current density, and suddenly becomes nil, i.e. no metal is deposited below a certain minimum current density.

It is thus obvious that the "throwing power" of chromium plating solution of the chromium acid type must be bad, and though it may be improved, as for instance by using a solution like Dr. Liebreich's which deposits some chromium down to a very low current density, yet it is not apparent how it can ever be made at all comparable with that of a nickel solution. In some cases, auxiliary anodes can be used to improve matters, and these being of lead can be easily fashioned to the required shape.

E. J. Dobbs, Birmingham, stated that he was in Leipzig a short time ago, and saw Dr. Pfanhauser's solution working. He was sorry to say that it did not reveal a good throwing power—for a tube some 4" in length and about 2" in diameter, the chromium had not deposited more than 1/16" inside the tube.

REPLY FROM MR. OLLARD

With regard to the controversy between Dr. Pfanhauser and Dr. Liebreich on the theoretical action of the bath, I consider that probably Dr. Liebreich has the better case. In his opinion, the reduction of the chromic acid undoubtedly took place in stages, and he does not see any difficulty in assuming that the bivalent chromium ions existed in the cathode layer of a solution of chromic acid during electrolysis, even though an excess of chromic acid might be present in the body of the solution. This would explain why it was possible to obtain deposits of chronium from solutions that had not been reduced.

I am interested to hear from Mr. Dobbs that Dr. Pfanhauser's solution had no better throwing power than the average chromium solution. I have not, however, had an opportunity of either testing Dr. Pfanhauser's deposits or to inspect his plant, and am, therefore, unable to give an opinion as to the value of his process.

With regard to Mr. MacNaughton's remarks on the efficiency of the solution, it is probably true that comparing the weights of chromium and those of nickel deposited, the chromium deposited very fast, and that also due to the fact that it resists corrosion, and is very hard, much thinner coatings of chromium will give the same results as thicker ones of nickel, as these former do not require to be polished, and are not, therefore, worn away in the same manner as nickel would be.

With regard to the hardness of the deposits, I have found that the bule-grey deposit referred to can be obtained very much harder than 5-600° Brinell; in fact, one sample of this type has given a Brinell figure of 910. This sample cannot be scratched with a knife or file, and will scratch glass.

With regard to the throwing power, this has always been a great draw-back to this type of solution, and I am of the opinion that while this might be somewhat increased it is unlikely that solutions of this type will ever have as good a throwing power as the ordinary solutions used in plating. I do not see how the cathode polarisation can be materially increased and the fact that there is a critical current density below which no chromium will be deposited makes this matter very much worse.

Plating and Finishing Hinges

Written for The Metal Industry by CHARLES H. PROCTOR, Plating Chemical Editor

The large steel butt or hinge manufacturers use the following methods.

The butts are fabricated from cold rolled steel, the smoother the surface the better. To remove the surface grease, etc., the butts are tumbled in sawdust to clean them, and at the same time acquire an additional surface lustre.

The two halves of the butts are then assembled and a second tumbling is given them in cleaner sawdust. This second batch of sawdust, when it has become quite greasy, is used for the first tumbling operation.

The butts are then framed up, about a dozen or more to a frame and copper plated in a hot copper cyanide solution, which does the cleansing and plating in one operation and puts on a deposit in about 10 minutes. The hot copper cyanide solution is made up as follows:

Water	1 gallon
Sodium cyanide 96-98%	4½ ozs.
Copper cyanide	3 ozs.
Bisulphite of Soda	1½ ozs.
Caustic soda 73-76%	½ oz.
Sodium hyposulphite	1/32 oz.

Anodes: heavy soft rolled copper sheet.

Voltage: 4 to 5.

After plating, the butts are thoroughly washed in cold water, then in boiling water and oxidized in a solution composed of polysulphide, 1 lb.; water, 60 gallons; aqua ammonia, 1 fluid pint. The butts are then removed, washed, dried and buffed to show the copper through the oxide coating in spots.

The butts are then lacquered by the dipping method. This can be done by hand, but also in automatic machines, designed for this purpose.

The brass plating methods are identical except for the solutions which are made up as follows:

Water	1 gallon
Sodium cyanide 96-98%	7½ ozs.
Copper cyanide	4 ozs.
Zinc cyanide	1¼ oz.
Bisulphite of soda	2 ozs.
Aqua ammonia 26°	½ oz.
White arsenic powdered	1½ grains

Anodes: heavy soft sheet brass.

Voltage: 5 to 6. Temperature 80° F.

Also after plating, the butts are brushed down with either brass brushes or Tampico wheels to produce a brush brass finish. After brushing, lacquer as above.

Bronze and gun metal finishes are put on as above, the solutions being as follows:

Bronze		Gun Metal
Water	1 gallon	Copper plate, then immerse in
Sodium cyanide 96-98%	7 ozs.	polysulphide. Dip as outlined;
Copper cyanide	4 ozs.	wash in cold and boiling waters.
Zinc cyanide	1½ oz.	Dry out in sawdust; scratch
Bisulphite of soda	2 ozs.	brush with soft brush, then
Hyposulphite of soda	1/32 oz.	lacquer.

Anodes: heavy soft low brass, 90 copper, 10 zinc.

Voltage: 4 to 5. Temperature: 80° F.

The sawdust method is also used in cleansing steel nails and copper and steel rivets. Clean sawdust must be used to puts a bright lustre on the copper rivets, etc.

All solutions should be prepared by first dissolving sodium cyanide in one-third total amount of water, to be used at 140 deg. F. Dissolve therein the copper or the copper and zinc, add the balance of the water cold, then add salts in the order given, then ammonia. Arsenic should be dissolved in three times its weight of caustic soda and a little hot water; then mixed in solution.

Secondary Metals in 1924

An Abstract of the Annual Survey by J. P. DUNLOP, Bureau of Mines, Washington, D. C.

MARKET CONDITIONS

The most significant feature of the secondary-metal trade in 1924 was the large expansion in the export of certain classes of scrap metals and drosses. This expansion seemed to reflect a change in the raw material situation in Europe, for exports of scrap metals increased in a much greater ratio than those of primary metals. During the same period that exports of scrap metals from the United States showed such large gains the imports of scrap metals from Europe decreased to quantities less than in pre-war years. The decreased imports were not so significant, for the decline merely emphasized the fact that the large postwar stocks of scrap metals in Europe had been consumed or exported.

The recoveries of secondary lead, tin, antimony, aluminum, and nickel increased in 1924, both in quantity and in value. The average price of all the above metals except nickel was greater in 1924 than in 1923. The average price of copper, however, was 1.6 cents less in 1924 than in 1923, and the large decrease in remelted brass scrap and a considerable decrease in the quantity of zinc recovered by redistillation and remelting more than offset the increased quantity and value of the other metals. The decrease in total value from the year 1923 was $4,840,000, or 2 per cent, and the decrease in quantity of metals and alloys recovered was also about 2 per cent. The decreases, however, were not in scrap metals available and collected, but in such material smelted and refined, for much larger quantities of waste metals and drosses of certain classes were exported and much smaller quantities imported in 1924 than in 1923.

Stocks of scrap metal at dealers' warehouses and at secondary-metal refineries were normal in 1924, for the first time since the war. Business was good on the whole, and much more profitable than in 1923. As tin and lead were high in price and lead was sometimes scarce, there was an active demand for white-metal alloys and drosses. Battery plates and mud were especially active at times, and the offerings were below requirements. The supplies of secondry copper and brass were ample in most sections throughout 1924, though the export demand for yellow brass scrap, new brass clippings, and turnings was exceptionally active late in the year and there was a temporary shortage at the eastern seaboard.

Large companies, adequately equipped, many of them having widely distributed plants or selling agencies, handle the bulk of the non-ferrous scrap and drosses. Buying large quantities of metals and drosses, and employing metallurgists and chemists, they can use scrap to the best advantage and sell metals and alloys on close specifications or by brands. The tendency in the secondary-metal industry will be more and more to consolidation, as it has been in other important industries. The change will bring a steadier supply of guaranteed metals and alloys and induce more foundries and other plants to buy alloys and composition metal instead of virgan pig metals and scrap metals.

The saving and the proper segregation of metal wastes by the larger foundries and metal users becomes more general each year, but the higher costs of collecting, shipping, and sorting small quantities of waste metals from country districts and small towns have tended to hamper the movement of such material to the consumer. Fewer itinerant waste collectors frequent the highways and byways, and only a real scarcity and high prices will restore the glory of the old days to the collection of old rags, paper, and small metallic articles discarded by householders, who in their present financial condition scorn to be bothered with keeping such materials and selling them to the wandering junkman for a few cents. It is difficult, moreover, for the seller of such material to realize that the purchaser of junk cannot afford to pay more than a tithe of the ultimate cost to the consumer of such waste.

SECONDARY METALS OF CERTAIN CLASSES RECOVERED IN THE UNITED STATES, 1923-24

	1923		1924	
	SHORT TONS	VALUE	SHORT TONS	VALUE
Copper, including that in alloys other than brass	193,200	$56,800,800	196,500	$51,483,000
Brass scrap remelted	311,000	72,843,800	274,000	58,444,200
Lead as metal	96,430	27,228,600	90,400	32,720,000
Lead in alloys	98,060		114,100	
Zinc as metal	65, 210	10,042,200	58,886	9,020,000
Zinc in alloys other than in brass and in chemical compounds	8,630		10,500	
Tin as metal	7,892	25,316,000	7,700	31,062,100
Tin in alloys	22,318		23,600	
Antimony as metal	245	1,252,800	90	2,025,600
Antimony in alloys	7,776		9,314	
Aluminum as metal	6,800	10,824,600	10,350	14,596,200
Aluminum in alloys	14,500		16,650	
Nickel as metal	177	1,109,800	114	1,227,500
Nickel in non-ferrous alloys and salts	1,373		2,126	
		$205,418,600		$200,578,600

Increasing Uses for Aluminum

The aluminum-alloy piston for motor cars instead of cast iron is growing rapidly in favor, both by automotive engineers and the general motoring public, according to Dr. Robert J. Anderson, consulting metallurgical engineer to the Kant-Skore Piston Company, Cincinnati, Ohio. The aluminum-alloy piston was first used in 1913, when certain automobile manufacturers in France and Belgium employed aluminum-alloy pistons for racing work. In 1914, with the advent of the world war, this type of piston was developed extensively for use in aviation engines. The introduction of the aluminum-alloy piston for general use in motor cars followed.

The volume producers of high grade motor cars like Chrysler, Hudson, Essex, Dodge and others have standardized on the aluminum-alloy piston in place of cast iron, and this piston is now standard on twenty-seven makes of American motor cars. The replacement trade in aluminum-alloy pistons is very large and is still growing.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1926 by THE METAL INDUSTRY PUBLISHING COMPANY, Incorporated

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year : : SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

ADVERTISING RATES ON APPLICATION. FORMS CLOSE THE FIRST OF THE MONTH

Palmer H. Langdon.....Editor and Publisher
Adolph Bregman.....Managing Editor
Thomas A. Trumbour.....Business Manager
Evan J. Robinson.....Advertising Manager

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number: Beekman 0404. Cable Address: Metalustry

Vol. 24 New York, April, 1926 No. 4

Contents

Handy & Harman 137
A History of this Precious Metal Now 59 Years Old.
A Description of the New Plant.
By F. A. WESTBROOK

Pinches in Rolling Nickel Silver 140
By WM. J. PETTIS

Metallic Antimony 140
By JESSE L. JONES

Drop Forging Metals 141
A Description of British Practice. Part 1—Aluminium Alloys.
By DROP FORGER

Reclamation of Foundry Sands 143
Methods Practiced at the Ohio Brass Company. A Paper Read Before the Quad City Foundrymen's Association, Moline, Ill., January 25, 1926.
By A. A. GRUBB

Casting Bronze Bars 145
By W. J. REARDON

British Institute of Metals 146
Abstracts of the Papers Read at the Annual General Meeting in London, England, March 10-11, 1926.

A Rapid and Accurate Method of Analysis of Brass 148
By R. F. SMITH

Band Saw Speed 148
By W. L. ABATE

Hardness of Plated Metals 148

Testing Materials Society Meeting 149
Group Meeting of American Society for Testing Materials Committee at the Providence Biltmore Hotel, Providence, R. I., March 17-19, 1926.

Nickel, Copper, Brass and Silver Solutions..... 150
By CHARLES H. PROCTOR

A General Survey of Chromium Plating 151
Discussion of a Paper read at the Meeting of the Electro-Platers' and Depositors' Technical Society, Held at the Northampton Polytechnic Institute (England).

Plating and Finishing Hinges 153
By C. H. PROCTOR

Secondary Metals in 1924 154
An Abstract of the Annual Survey by J. P. Dunlop, Bureau of Mines, Washington, D. C.

Increasing Uses for Aluminum 154

Editorials 156
American Dependence Upon Foreign Metals and Graphite.
Reclaiming Foundry Sand.
Publicity for Platers.
Improving the Plating Industry.

Shop Problems 158

Patents 160

Equipment 162
New Oil Burning Device.
New Oven Furnace.
New Alternating Current Polishing Lathe.
Flask Pin Polisher.
New Design Compressor.
High Speed Brass Rod.

Associations and Societies 164

Personals 165

Obituaries 166

News of the Industry 167

Review of the Wrought Metal Business..... 175

Metal Market Review 175

Metal Prices 176

Supply Prices 178

Buyers' Guide—Advertising Page 75. Edition this month, 6,000 copies

EDITORIAL

AMERICAN DEPENDENCE UPON FOREIGN METALS AND GRAPHITE

Americans are so used to believing that the natural resources of their country are both inexhaustible and all-inclusive that the general public has experienced a real shock from Secretary Hoover's warning that certain basic commodities, indispensable to our industries, are obtainable only from foreign sources, and are in most cases controlled by foreign governments. A number of commodities were listed and among them were the metals, tin and mercury.

The United States uses from 50 to 60 per cent of the world's tin production. In 1925 importation was about 750,000 long tons with a gross value of over $91,000,000. Almost no tin was produced in this country, the imports coming from the Dutch East Indies, the British Malay States, and Bolivia.

Several American companies, among them being the National Lead Company, and the Guggenheim interests are developing properties in Bolivia. While the smelting and refining of this material is done abroad, it is controlled by American capital and for that reason we have some assurance of our supply. It seems impossible for us to work out any better method of control, as commercial tin deposits in this country are almost non-existent. It has been stated on good authority, moreover, that we shall never be emancipated from foreign domination over the tin situation until substitutes are found for tin, which will enable us to change our methods if the necessity should arise.

At the present time about 40 per cent of all the tin used in the United States goes into tin and terne plate; 33 per cent into solder, babbitt and bearing metals; about 6½ per cent into brass and bronze; 5½ per cent into tinfoil; 3 per cent, collapsible tubes; 2 per cent, white metal, and the remainder, miscellaneous. To search for substitutes in such variety of basic and indispensable materials is a problem which would stagger any group of metallurgists, however capable.

The Committee of the Mining and Metallurgical Society of America on the Foreign and Domestic Mining Policy, and the Committee of the American Institute of Mining and Metallurgical Engineers on Industrial Preparedness, have issued a joint report of their findings in a booklet, entitled "International Control of Minerals." Their conclusion is that "tin must necessarily be placed among the minerals which we almost entirely lack and it follows that we must depend for our tin on other countries. For no conceivable condition of peace or even of war would permit us ourselves to produce any material part of our own requirements."

The only possible outlet would seem to lie in the discovery of tin in new fields to break the control of the world tin market by the small number of present producers. That also is problematical.

Mercury comes almost entirely from Spain and Italy. There seems to be no evidence of the existence between these countries of any concerted efforts to control prices, and although the industry in both countries is controlled by the governments, no trouble has been experienced by the United States in obtaining its supplies. The committees mentioned above recommend government aid in stabilizing American production of quicksilver, which is possible if such aid is forthcoming; presumably in the form of a tariff, although one of the three members of this sub-committee dissents from this conclusion. The importance of quicksilver is concentrated largely in the drug, chemical, explosive, paint and electrical apparatus industries, with felt manufacture, gold and silver recovery from ore, and instrument manufacture using comparatively small amounts.

The United States consumes about 45 per cent of all the antimony produced in the world, taking, in normal times, about 10,000 tons per year. Seventy-five per cent of this total goes into type metal, anti-friction bearings, Britannia metal and antimonial lead. Substitutes can be provided, such as calcium, barium, strontium, magnesium, and copper, but they are more expensive and would be used only in emergencies. The most important antimony producing country is China, and as her own market is small, she is dependent largely on the United States, and of course, Europe, for disposal of her product.

The cost of antimony is complicated by the fact that coinage in China is largely composed of silver which fluctuates in price. Hence, the price of antimony varies with the price of silver and stability is rare. No difficulty has been experienced however, on account of restriction of output. If the price should be increased beyond a reasonable figure and maintained, production would begin in Mexico or Bolivia, and prices would be forced down again.

The graphite situation has been covered a number of times in these pages and the position of the American crucible manufacturers is well known. They are firmly opposed to tariffs on Ceylon and Madagascar graphite, claiming that these graphites must be used to make satisfactory crucibles. The sub-committee on graphite of the committees mentioned above, seems to feel that this belief is due to "custom founded on past experience," and that equally good crucibles can be made by the use of domestic flake. They recommend a reasonable tariff to induce crucible manufacturers to determine adequately the practicability of domestic flake, but we have been unable to find a single manufacturer of crucibles to agree with them.

The committee does state, however, that such a tariff should be for a limited period only, to determine whether a domestic graphite industry can become self-supporting and to give it time to bring its cost down to a foreign level. "It is doubtful whether the government will be justified in continuing the tariff levy indefinitely."

Under any circumstances, we have large deposits of graphite in this country which can be used, after a fashion at least, in cases of emergency. To attempt to control the known foreign deposits would seem to be out of the question.

The platinum industry has for some time suffered from the stoppage of production in the main fields in Russia. Colombia, Australia and Canada (to a limited

extent) have been supplying the market. Consumption in the United States is about 175,000 ounces per year, of which 50 per cent to 60 per cent goes into jewelry; 15 per cent to 20 per cent into the electrical industry; 10 per cent to 15 per cent, dental industry, and about 10 per cent, chemicals. No commercial deposits are known to exist in this country and we shall always be dependent upon foreign sources. Substitutes are being actively sought for, however, particularly for industrial uses, and if these are found the stoppage of imports for one reason or another, would affect only their use in jewelry, which would be of small importance from an industrial standpoint.

RECLAIMING FOUNDRY SANDS

In this issue on page 143 is an article describing the methods used by one of the largest manufacturers of brass castings in the United States, for reclaiming old sand used in brass molding. In view of the widespread attention which molding sand testing methods have had in the last two or three years, it is worth while to stop and read carefully the results of the application of these methods on a large and decidedly practical scale.

In the first place, the question will arise in the mind of every foundryman "How long can I continue to reclaim my sand? In other words, can I keep using it over and over again indefinitely?" Obviously not. Everything wears out in time, even molding sand, from one cause or another. The point is, however, that by the use of the proper methods, molding sand which was formerly thrown away can now be used over a number of times. The proportion of molding sand which is discarded now in the Ohio Brass Company is only a fraction of that which they used to lose. Add to this the fact that the percentage of rejected castings, due to molding troubles, has decidedly decreased, and we have an understanding of the value of controlling molding sands. The real point to consider is not the advisability of testing methods for controlling these molding sands, but the question of what methods to use. Certainly, they must be as simple as possible, easy and quick to perform as they can be made and essentially practical in every way. They must be suited to the plant rather than the research laboratory. The tests devised by the American Foundrymen's Association are perhaps not yet perfect, but they do have certain outstanding advantages which cannot be gainsaid.

1. They are correct in principle.
2. They are devised with an eye to practicability and used by operating foundry metallurgists.
3. The equipment required is comparatively inexpensive as testing equipment goes.

That further effort should be made to continue to simplify these tests, or to substitute better ones, perhaps, is certain, but in the meantime much more will be gained by the adoption of the present testing methods than by refusal to use them. Moreover, improvements in these methods will come, not by turning away from what has been worked out, even though it is not suitable for every foundry, but by working with these methods and developing improvements around them.

The record at the Ohio Brass Company proves the efficacy, in principle, of testing and reclaiming molding sands. Particular methods may be varied to suit local conditions but no foundry, however small, can afford to be without some methods of checking its practice in this department.

PUBLICITY FOR PLATERS

To our friends, the American Electro-Platers' Society, we have a suggestion to make in the interests of all of us. At the present time this Society is the only one, of which we know, which refuses to permit the publication of its papers by the general trade and technical press. The reasons, so far as they have reached us, for this policy, consist largely of an unwillingness to let these publications "get something for nothing."

This is a very simple-minded view to take of the matter, and we believe, easily corrected. In publishing the papers read at society meetings, a technical journal does not "take something for nothing." It takes something for which it returns a large payment in publicity and in the improved standing which that Society and the author of the paper acquire before the readers of that publication. Aside from the unfairness of keeping the papers from such publications, which make every effort to aid societies and to further their growth in every way that they can, it is obviously unwise for the society to cut off such large avenues whereby it can increase its membership and improve its standing.

The standing of the American Electro-Platers' Society is high, but the policy followed out in this regard has certainly prevented it from growing as fast as it might. The reports of meetings would be read much more eagerly and with much more interest by the general trade if the papers could be included.

If the Society feels that it ought to reserve its papers for its own publication, it should bear in mind that The Monthly Review can publish only two or three papers every month, at the most. The members of the Society who are unable to attend the Convention must wait, sometimes almost a year, to find out everything that went on. It would be much better for the members at large if the papers were released at once so that they could get their information in a comparatively short time.

Almost all of the great scientific and technical societies release their papers at once. When will the American Electro-Platers' Society do likewise?

IMPROVING THE PLATING INDUSTRY

Every industry has at least two important sides—technical and commercial. The electro-plating industry is no exception to the rule, and the platers themselves have taken up and made a tremendous success of the project of improving the technical side of their industry through the American Electro-Platers' Society.

Only recently however, a movement was started with the same general idea in view, except that it was applied to business. The International Fellowship Club, an organization of salesmen engaged in supplying the needs of the plating industry, is less than two years old, but is already making excellent headway. Its principles are simple and can be summed up in the phrase, "Honesty is not only the best policy, it is the only policy."

At the next meeting of this club, a code of ethics will be adopted to act as a guide for those engaged in selling to electro-plating plants. We can think of no more worthwhile organization than this one, and we wish the International Fellowship Club every possible success.

GOVERNMENT PUBLICATIONS

Lead in 1924, by Siebenthal & Stoll. Bureau of Mines, Washington, D. C.

Secondary Metals in 1924, by J. P. Dunlop. Bureau of Mines, Washington, D. C.

Antimony in 1924, by F. C. Schrader. Bureau of Mines, Washington, D. C.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical

ACID ZINC SOLUTION

Q. I am running a 2,000 gallon sulphate of zinc still plating bath made up to the standard formula: zinc sulphate, 2 lbs.; aluminum sulphate 2 ozs.; sodium chloride 2 ozs.; black molasses 1/10 oz. I have been running this bath for about 5 months, plating iron castings and have got a very good white adherent deposit of zinc.

Now I know it is customary to add a certain amount of sulphuric acid to an acid zinc bath. Will you kindly tell me what is the purpose of adding acid to this bath and what effect does it have on the deposit? Would you recommend the addition of sulphuric acid to this solution, and if so in what proportions. Also advise me if the addition of acid will have any tendency to throw the zinc in the deep recesses of the castings.

A. The formula you are using for acid zinc plating upon iron castings is of the usual type. You can increase its throwing power by adding about 2 ozs. more sodium chloride and 8 ozs. of zinc sulphate per gallon of solution. Without an addition of sulphuric or acetic acid at intervals, the zinc solution slowly becomes neutral and the anodes coat over with zinc oxide which has a white color.

For a 2,000 gallon solution, when in constant operation during the daytime, an addition of a minimum of 8 fluid ozs. of sulphuric acid should be made each evening, dissolved in 1 gallon of water, and then thoroughly stirred into the solution. The same amount of 75 per cent acetic acid can be used or increased to 12 ozs. Many firms operating large acid zinc solutions, prefer to use acetic acid or a mixture of acetic acid and sulphuric acid, equal parts by measure. A small amount of free acid is always necessary in solution to maintain a normal anode reduction, and a satisfactory rate of deposit. One of the best types of acid zinc solutions should be composed as follows:

Water	1 gal.
Zinc sulphate	3 lbs.
Sodium chloride	4 ozs.
75% acetic acid	1 oz.

As a rule no colloid is required, but ⅛ oz. corn sugar per gallon increases the lustre of the deposit.—C. H. P. Problem 3,506.

ALUMINUM COOKING UTENSILS

Q.—I am writing for information about aluminum cooking utensils, sand cast. I use No. 60 emery for roughing out, but the metal is full of pin holes and will not come out. The manager asked me if I could find out the right mixture for aluminum cooking utensils and right heat for pouring.

A.—The mixture used by some of the makers of cast aluminum cooking utensils consists of 96 aluminum, 4 copper. Only the best of metal should be used and as a deoxidizer add 1% of a 50% silicon and 50% aluminum alloy. Make up a hardener of 50 copper and 50 aluminum. Pour into ingots and use as follows:

Melt 91 of aluminum
Add 8 of hardener
Add 1 of 50% silicon and 50% aluminum

Do not overheat your metal and pour as cold as consistent to obtain good work. If you do this we are of the opinion your trouble due to pin holes will be overcome. We assume you are using the proper method of molding and gating, as most times pin holes are due to the metal mixture or melting practice.—W. J. R. Problem 3,507.

ALUMINUM IN CHILL

Q.—Can you give me any information concerning the results obtained in casting aluminum by the chill method?

A.—There is considerable of this work now being done. One I have in mind is the casting of aluminum piston castings in permanent molds. Also any number of die casters are casting aluminum very successfully, and the results both from the permanent mold and die casting process are very satisfactory.—W. J. R. Problem 3,508.

ANTIQUE BRASS

Q.—We are enclosing sample link. Would you kindly let us know the easiest and best way to get this finish? We have parts, sheet brass, cast brass and cast bronze; also brass plated parts to be finished like enclosed sample. Most parts are hammered sheet brass and all require antique brass color.

A.—A finish similar to the one on the sample brass plated steel link can be produced as follows:

1. The articles must be made from brass or brass plated, fairly heavily. The surface should be scratch-brushed, wet.
2. Prepare a solution as follows:

Water	1 gallon
Caustic potash	8 ozs.
Liver of sulphur or polysulphide	2 ozs.

Heat to 180° F.

3. Immerse the scratch-brushed articles after washing in water in the above dip until they become a very dark golden brown; then remove, wash in cold water and in boiling water. They should remain in the boiling water for a few minutes.
4. Remove from boiling water; dry out in sawdust and when cold, scratch-brush dry with a soft brass wire brush; lacquer afterwards.
5. If the color is not dark enough, a toning dip may be used to darken the color after removing from the boiling water. This dip should be prepared as follows:

Water	1 gallon
Copper sulphate	2 ozs.
Sulphuric acid	¼ oz.

After immersing in this dip, to produce a darker tone, wash in cold and hot waters; dry in sawdust; scratch-brush and finally lacquer. Brown tones on brass depend a great extent upon manipulation, as you can realize from this data.—C. H. P. Problem 3,509.

BRIGHT BRASS DIP

Q—Please send me a formula to brighten red brass castings: 85-5-5-5.

A—If you want to produce a regular bright acid dipped finish upon the red brass castings, the solution should be prepared as follows:

Nitric acid 38°	2 gallons
Sulphuric acid 66°	1 gallon
Water	1 quart
Muriatic acid	1 oz.

Mix the acids in the order given and then let them cool down before using. A moment's immersion in the acid dip will give a bright surface. Follow up the dipping by washing in cold and boiling water, and dry out in sawdust to prevent staining. The formula given is the customary bright acid dip. It is possible that the following mixture might answer your purpose:

Water	1 gallon
Sulphuric acid 66°	1½ pints
Bichromate of soda	8 ozs.

The castings can be immersed somewhat longer in this dip. Afterwards wash the castings and dry out as outlined.—C. H. P. Problem 3,510.

BRONZE FINISH

Q.—We are desirous of plating fittings with the finish as on the enclosed samples.

A.—The finish on the small hairpins is known as a bronze finish, which is applied by the aid of a revolving tumbling barrel and the bronzing medium is a quick drying brown baking japan. The surface of the steel, such as hairpins, must be clean and bright before applying the brown japan. The articles when coated as outlined must be oven-dried at a temperature in excess of 300° F. The japan will be applied more uniformly if sprayed on the articles while they are revolving in the barrel.

A similar finish is applied to steel shoe and vest buckles by immersing the cleansed and perfectly dry articles in a molten mixture consisting of 2 parts sodium nitrate and 1 part sodium nitrite by weight. The salts must be heated in an iron kettle to 600° F., which will be about the correct temperature for the brown bronze. The articles can be readily immersed in the molten mixture in an iron wire basket. As soon as the color has been obtained, remove quickly and cool in water; dry out in boiling hot water and sawdust. The bronze surface thus produced can, if necessary, be dipped, lacquered or oiled with any thin fluid quick drying oil to protect the finish. Heated sea sand can also be used to produce a similar finish.—C. H. P. Problem 3,511.

CHEMICAL RUST PROOFING

Q.—We are interested in a rust proof finish, such as treating with heated oil or a finish similar to Parkerizing, for a Stillson wrench.

A.—We submit the following methods to produce a black finish upon your product:

1. The simplest process would be to tumble in a steel cylinder heated to 750 deg. F., with the carbon black. The carbon black should be charred bone charcoal and a small amount of tallow. Firms in the Middle West use pine sawdust instead of the charred bone and tallow. The sawdust is ignited in the cylinder; the excess of smoke allowed to escape and while the sawdust glows from the heat. The steel articles are placed therein and heated to 700° F. The cylinder must be fairly air tight.

2. Auto spark plug manufacturers produce a gun metal finish upon their products by immersing in a molten mixture of sodium nitrate and black oxide of maganese heated in an iron kettle to 750° F.; (sodium nitrate 1 lb.; black oxide of manganese 1 to 2 ozs.). Heat until a uniform blue-black color results, then remove, quench in cold water, immerse again in boiling water, drain well and oil in heated paraffin, linseed oil or heavy cylinder oil. Allow to dry for some time and wipe off the excess oil.—C. H. P. Problem 3,512.

FINISHING MIRROR-LAPPED ROLLS

Q.—Can you give us any method of keeping the bright finish on mirror-lapped rolls? Our rolls seem to pick up some lint, etc., from rolling, which marks the finish of the rolls to the extent that we have not been able to find a metal polish which will remove these marks, with out any damage to the finish of the rolls.

A.—We recommend tin oxide, either in the dry form or mixed with the stearic acid, using 2 parts stearic acid to 1 part tin oxide. The stearic acid must be melted so that it becomes fluid. The tin oxide should then be thoroughly mixed into the stearic acid. Heavy waxed paper can be rolled into cylinder form and one end closed. The molten mixture can be poured into the waxed paper cylinder and when cool can be used as a polishing cake.

Oxide of chromium is a compound used in polishing. Deposits of metallic chromium are as hard as case hardened steel, and so may answer your purpose. The oxide of chromium should be mixed with the stearic acid in the same proportions as with tin oxide. A strip of felt, say 2 inches in diameter suitably beveled to conform to the roll to be polished could be used in a suitable holder and with provisions to give the necessary pressure of the felt against the roll. The rotation of the roll will or should give the necessary friction. Use either one or the other of the mixtures. Or the tin oxide may be used dry, or mixed with a little kerosene to product a lustre finish. The arrangements to hold the felt will have to be left to your own judgment.—C. H. P. Problem 3,513.

FINISHING STEERING WHEELS

Q.—Can you give me any information on how the different shops finish steering wheel spiders? I have heard that they spin them on a chuck all over. Also the different wheels used; in other words, a general outline as to how to finish this work. The wheels are made of aluminum and die cast metal.

A.—If the auto steering wheel spiders can be polished by the aid of a chuck so that spiders can be revolved against the polishing wheels, then the operations could be very much simplified. It is presumed that the spiders are cast. If so, and they are not too rough, then the polishing could be done in two operations, 80 and 120 emery. The polishing wheels should be made up of sewed buffs which render them more flexible.

After polishing, cut down with Tripoli composition and color buff with white diamond composition. It is advisable to use a little kerosene on the buffs; the color will be cleaner.

In the polishing operations, (to keep the emery from clogging, with the die casting metal) apply a little beeswax and then a little Tripoli or emery paste, a better cutting surface will thus be maintained. It should be possible to cut the die castings down by a tumbling operation; the abrasive to be Cleveland sand stone chips, water and sodium cyanide, about 1 oz. per gallon of water.—C. H. P. Problem 3,514.

LOOSE COPPER PLATE

Q.—I have a cyanide copper solution which I use occasionally, but which, while the color is good, strips when buffing.

A.—The indications are that your cyanide copper solution is too low in free cyanide, thus preventing a true adherence of the copper to the base metal.

First, add 1 oz. bisulphite of soda per gallon of copper solution, then add 1 to 2 ozs. sodium cyanide per gallon of solution.—C. H. P. Problem 3,515.

LIGHT ALLOYS

Q.—We would like to know about a non-corrosive metal similar to Duralumin.

A.—Duralumin is a light alloy and consists of:

Copper	3.0-4.5
Magnesium	0.4-1.0
Manganese	0.0-0.7
Aluminum	Balance
Iron as impurity	0.4-1.0
Silicon as impurity	0.3-0.6

It can be had from the Aluminum Company of America and the Bausch Machine Tool Company, Springfield, Mass. It can be forged when heat treated, possessing a tensile strength of about 60,000 lbs. per square inch.

There is another alloy similar to Duralumin, called Magnalium. This alloy consists of 85 per cent to 98 per cent aluminum; balance magnesium.—W. J. R. Problem 3,516.

WATCH DIAL ETCHING

Two etched watch dials in package are sent to get following information:

1. Acid resist paint to stand up for deep bite as on dial; duration of time required.

2. Suitable stop off of shellac, wax or varnish for gold and silver plating.

3. Silver deposit has a sparkle grain finish. This finish is very new to us, and we would like to get it if possible.

A.—We are pleased to answer your several questions;

1. An air drying asphaltum varnish or a varnish prepared by dissolving asphaltum in turpentine to a suitable consistency makes an excellent stop off or resist. The turpentine should be heated in a hot water bath. After preparation the varnish should be filtered through several thicknesses of cheese cloth to remove dirt and insoluble matter. Heavy black printer's ink is used extensively for etching purposes with the transfer process.

2. Air drying asphaltum varnish or the asphaltum varnish in turpentine mentioned; gum guiacum dissolved in acetone is also used for gold and silver stop off varnish. It is usually colored with a little aniline blue or violet to make the varnish distinctive.

3. The crystal or snowflake finish noted in etched silver dials results from the action of the etching acids upon the brass. Such acids are fairly saturated solutions of chloride of iron in water, to which is added sodium bichromate to neutralize the excess of acid. It is possible, however, that after etching the dials or name plates, they are immersed in an acid dip consisting of water 1 gallon; sulphuric acid, 24 ozs.; sodium bichromate, 4 ozs.

The etching varnish must not be removed until the dials or plates have been acid dipped and silvered in a regular warm silver dip immersion solution. The etching ground is then removed and the letters or numerals that show brass are blackened by immersing the plates or dials in the regular copper carbonate and ammonia oxidizing solution. It is presumed that you are familiar with the latter operations.—C. H. P. Problem 3,517.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,567,318. December 29, 1925. **Method of Making Metallic Magnesium.** Paul Cottringer and Sheldon B. Heath, Midland, Mich., assignors to The Dow Chemical Company, Midland, Mich.

In the production of metallic magnesium, the steps which consist in electrolyzing a molten bath including magnesium chloride, and introducing more magnesium chloride into such bath adjacent the anode.

1,567,363. December 29, 1925. **Forming Continuous Soft-Metal Bars from Molten Metal.** Benjamin S. Elrod and William Hector, Omaha, Neb., assignors, by mesne assignments, to Omaha Trust Company, trustee, a corporation of Nebraska.

In a mechanism of the class described, a die body having a continuous longitudinal channel through it, means connected with said die-body for delivering molten metal to one end of said channel, means for cooling the die to solidify the metal during its passage through the channel, and a central partition in the die-channel extending from the cooled portion thereof to a point at which the metal is constantly molten, whereby to divide the molten stream and cool the same into separate bars.

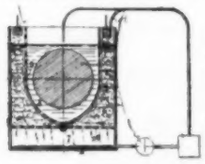
1,567,396. December 29, 1925. **Soldering Alloy and Method of Making the Same.** Ephraim D. Schwalm, Chicago, Ill.

The herein described method of making an aluminum solder of copper and tin, consisting of fusing the two metals with sodium and then introducing zinc into the fused elements, substantially as described.

1,567,625. December 29, 1925. **Plated Article and Its Manufacture.** Joseph A. Smith, Attleboro, Mass.

The process of coating metal articles, which comprises coating the article with an intermediate layer of a metal of a substantially low melting point, in coating the intermediate layer with a layer of metal of substantially higher melting point and then subjecting the coated article to heat under conditions causing an alloying of the intermediate layer and the metal of the article without any substantial inter-alloying with the outer layer.

1,567,737. December 29, 1925. **Making of Sheet Copper Electrolytically.** Marcel André Jullien, Paris, France.



Apparatus for use in the electrolytic manufacture of copper sheets of substantial size, comprising a container for the electrolyte a revolving cathode mounted in the container, and an anode serving as a container for copper waste or granulated black copper and comprising permeable walls and reinforcing members mounted on said walls in a slantwise direction to prevent deformation of the said walls without impairing the evenness of the electrolytic deposit on the surface of the revolving cathode.

1,568,224. January 5, 1926. **Bearing Metal.** Josef Karafiat, Schwechat, near Vienna, Austria.

Bearing metals of the ternary system tin-antimony-leads with an addition of metals capable of forming a solid solution with tin and lead excepting thallium, the said metals being added to main substance alloys of the state field III of the diagram of the said ternary system, the corner points of which state field represent: 10 per cent Sn, 10 per cent Sb, 80 per cent Pb;—55 per cent Sn, 5 per cent Sb, 40 per cent Pb;—50 per cent Sn, 50 per cent Sb, 0 per cent Pb.

1,568,234. January 5, 1926. **Coating for Molds.** Daniel H. Meloche, Detroit, Mich., assignor to Earl Holley, Detroit, Mich.

A coating for protecting iron molds, consisting of an inert refractory insulating material mixed with lampblack and a small percentage of soluble silicate acting as a binder only, for the lampblack and the refractory insulating coating.

1,568,669. January 5, 1926. **Soldering Solution.** Cloice B. Hull, Cleveland, Ohio.

A solution of the above character containing antimony trioxide, zinc chloride and glycerine.

1,568,728. January 5, 1926. **Process for Protection of Metallic Surfaces.** George C. Freeman, Philadelphia, Pa., assignor to Antiscale Corporation, Philadelphia, Pennsylvania.

The process of protecting a fluid-contacting surface of a metallic body against encrustation of scaling which comprises so connecting the terminals of a source of electric current to spaced points of said body that current is caused by said source of current to flow in said body in the said direction as the inherent current in said body.

1,568,753. January 5, 1926. **Paint and Varnish Remover and Process for Making the Same.** Edwin R. Littmann, Terre Haute, Ind., assignor to Commercial Solvents Corporation, Terre Haute, Ind.

A paint and varnish remover comprising a saturated aqueous solution of sodium nitrophthalate, acetone, ethyl alcohol, benzol and toluol.

1,569,130. January 12,1926. **Method of Hardening Copper.** Louies Nemitof, Kansas City, Mo.

The method of hardening copper consisting in embedding copper heated to a bright red in a mixture moistened with a hydrocarbon and comprising a silicious substance and a substance containing phosphate of lime, substantially as set forth.

1,569,314. January 12, 1926. **Melting Furnace.** William H. Chenowith and George C. Schimpf, Baltimore, Md., assignors to Harry D. Harvey, Baltimore, Md.

A melting furnace comprising an up right casing, a melting pot within the casing, a discharge-pipe leading from the pot through the wall of the casing, a spout on the outer end of said pipe, movable horizontally into and out of pouring position, and a burner adapted to heat the spout in the latter position.

1,569,484. January 12, 1926. **Process and Method of Disintegrating Metals in a Ball Mill or the Like.** Everett Joel Hall, Passaic, N. J., assignor to Metals Disintegrating Company, Inc., New York, N. Y.

The art of manufacturing metal dust which consists in mechanically disintegrating the metal, while keeping it covered with lubricating liquid which protects the metal against the effects of atmosphere and is inert to the metal, and which has a boiling point high enough to prevent excessive loss by vaporization during the disintegration, but not so high that there will be difficulty in its separation later from the metal by vaporization; and thereafter freeing the disintegrated material from the liquid by evaporation of the liquid, to produce a dry metallic powder.

1,569,564. January 12,1926. **Apparatus for the Pulverization and Projection of Molten Metal.** Wilhelm Müller, Flix, Spain, assignor to Sociedad Electra-Quimica de Flix, Tarragona, Flix Province, Spain.

Apparatus for metallization through the pulverization and projection of molten metal comprising in combination a support, wire supplying and feeding means mounted thereon, flexible current conducting and wire guiding tubes connected with the wire feeding means, a cross piece of insulating material, nozzles rigidly mounted on the cross piece and connected with the tubes and having the delivery ends arranged in close relation with respect to each other.

1,569,921. January 19, 1926. **Alloy for Pen Points.** Melvin M. Goldsmith, Chicago, Ill., assignor of one-half, by mesne assignments, to Goldsmith Bros. Smelting & Refining Company, Chicago, Ill.

An osmium alloy comprising 10 to 20 per cent of ruthenium, 3 to 10 per cent of nickel, and the rest osmium, 65 to 85 per cent.

1,570,064. January 19, 1926. **Method of Making Crucibles.** Arthur John Jackman, Forest Hills Borough, Pa., assignor to Vesuvius Crucible Company, Swissvale, Pa.

As an article of manufacture, a crucible for a metal melting operation wherein slag is formed, having a graphitic body portion adapted to contact with the bulk of the metal and having a portion adapted to contact with the slag and made from a material more resistant than the said body portion to the corrosive action of the slag, substantially as described.

1,570,634 and 1,570,635. January 26, 1926. **Deposited-Metal Pattern and Method of Making It.** Aruthur K. Laukel, Detroit, Mich.

A method of making metal patterns comprising forming an impression in a mold from a pattern, coating the surface with a conducting substance, and depositing metal thereon electrolytically to form a shell of considerable thickness.

1,570,763. January 26, 1926. **Metallic Composition and Method of Making the Same.** Adolph Miller, Kirkwood, Mo.

A metallic composition composed of about 90 per cent lead and about 10 per cent mercury.

1,570,802. January 26, 1926. **Means for Preventing Adherence of Cast Metal to the Mold.** Foord Von Bichowsky, Glendale, Cal.

A coating compound for molds of the character described comprising a substance containing an appreciable quantity of combined nitrogen in the form of a nitride of a member of the carbon group of elements.

1,570,819. January 26, 1926. **Method of Electroplating and Apparatus Therefor.** Blasius Bart, East Orange, N. J.

In the art of electrolytic deposition where a series of anodes are used and where the depositing operation is of different activity in different parts of the bath, the method which consists in causing the article to be coated to traverse continuously a path through the several parts of the bath where the depositing activity is variable, subjecting the article to the electrolytic depositing action of the bath for a prescribed period of time and causing the article during its passage to present all sides thereof repeatedly to the different anodes.

1,570,868. January 26, 1926. **Extruding Magnesium.** Richard L. Templin, Parnassus, Pa., assignor to American Magnesium Corporation, Niagara Falls, N. Y.

The method of plastically working magnesium comprising die-expressing the metal within a temperature range from 650° to 800° F.

1,570,893. January 26, 1926. **Method of Making Aluminum-Silicon-Alloy Castings.** Douglas B. Hobbs, Cleveland, Ohio, assignor to Aluminum Company of America, a corporation of Pennsylvania.

The method of making aluminum-silicon alloy castings, comprising filling a non-chilling mold with molten aluminum-silicon alloy, promptly removing the casting from the mold after initial solidification, and rapidly chilling the casting.

1,570,929. January 26, 1926. **Method of Protecting the Surface of Metal Molds.** Stanley M. Udale and Daniel H. Meloche, Detroit, Mich.

The method of protecting the metal surface of permanent iron molds, which consists in heating the surface of the iron molds by means of the flame of a blow torch directed against the surface of the said molds and injecting into the flame powdered magnesium oxide, whereby the particles of magnesium oxide are carried against the surface of the iron molds which are thereby coated with the magnesium oxide.

1,570,949. January 26, 1926. **Metal-Coating Machine.** Frank H. Cunningham, Youngstown, and Harry W. Moseley, Struthers, Ohio.

In a device of the class described, means for automatically carrying an article to be metal coated through a flux, automatic means for causing a head of flux to be forced through said article, means for continuing said article through a bath of zinc, means for causing a head of zinc to be forced through said article, means for allowing said article to roll by gravity in an inclined plane to a conveyor, substantially as described for the purpose set forth.

1,570,969. January 26, 1926. **Method of Manufacturing Coating for Permanent Metal Molds.** Fredrich Mayer, Solingen, Germany.

The method of manufacturing coatings for permanent molds for the production of aluminum castings which consists in dissolving the mineral matter such as graphite employed by the aid of a colloidizing process, diluting the same and rendering it capable of being readily poured into the mold.

1,571,540 and 1,570,541. February 2, 1926. **Plated Metal and Method of Producing the Same.** Victor D. Davignon, North Attleboro, Mass., assignor to General Plate Company, Attleboro, Mass.

In composite plated metal product having a finely attenuated surface of precious metal, a thin backing of relatively hard, tenacious metal capable of resisting dilute nitric acid, and a relatively thick base of metal relatively soft as compared with the backing and relatively cheap as compared with the surface.

1,572,382. February 9, 1926. **Metallic Alloy.** Ernest Raymond Crosby, Cleveland, Ohio, assignor to Aluminum Manufacturers, Inc., Cleveland, Ohio.

A metallic alloy containing aluminum in a preponderating amount, silicon from about 3% to about 8% tin and from an appreciable amount up to about 5%.

1,572,459. February 9, 1926. **Making Castings of Aluminum-Silicon Alloys.** Robert S. Archer, East Cleveland, Ohio, and Junius D. Edwards, Pittsburgh, Pa., assignors to Aluminum Company of America, Pittsburgh, Pa.

The method of making castings of aluminum-silicon alloy, comprising filling the mold with the molten alloy and causing the silicon in the alloy to take the form of minute particles by solidifying the alloy rapidly.

1,572,487-1,572,490. February 9, 1926. **Aluminum Alloys.** Lay Jeffries, Shaker Heights, Ohio, Roderick L. Johnston, New York, and Robert S. Archer, Lakewood, Ohio, assignors to Aluminum Company of America, Pittsburgh, Pa.

Various alloys of aluminum, copper, silicon and zinc.

1,572,502. February 9, 1926. **Aluminum Alloy.** Aladar Pacz, Cleveland, Ohio, assignor, by mesne assignments, to Aluminum Company of America, a corporation of Pa.

An alloy consisting of aluminum, copper and silicon in the proportion substantially of 70 parts by weight of aluminum, to 15 to 27½ parts of copper and 2½ to 15 parts of silicon.

1,572,503. February 9, 1926. **Composition of Matter.** Aladar Pacz, Cleveland Heights, Ohio, assignor, by mesne assignments, to Aluminum Company of America.

A die casting alloy containing nickel between about 2½% and 10% of silicon, and a preponderance of aluminum.

1,572,744. February 9, 1926. **Nickel Alloy and Method of Making the Same.** Paul D. Merica, New York, N. Y., assignor to The International Nickel Company, New York, N. Y.

The method of making nickel alloys, which includes deoxidizing the principal melt and then mixing it with molten aluminum.

1,572,996. February 16, 1926. **Alloy.** Pierre Girin, Paris, France, assignor to Société Anonyme de Commentry, Fourchambault & Decazeville, Paris, France.

That alloy of iron, chromium, nickel, tungsten and manganese comprising nickel 50 to 80%, chromium 8 to 25%, tungsten 0.5 to 8%, manganese 1 to 5%, and carbon 0.3 to 1%.

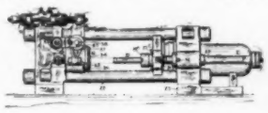
1,573,830. February 23, 1926. **Refining Lead.** Henry Harris, London, England.

Process of refining lead which comprises bringing molten lead while maintained at a temperature not exceeding about 500° C. into intimate contact with a molten reagent comprising molten caustic alkali, and gradually adding an oxidizing agent in such limited quantity that substantially no lead oxide or alkali oxysalt of lead is found in the resulting melt.

1,574,043. February 23, 1926. **Process for the Separation and Recovery of the Copper, Tin, and Lead Content of Brass or Bronze Secondary Metals and Their Residues.** Tannie Lewin, St. Louis, Mo., assignor of one-half to William Lewin.

The process of treating brass or bronze secondary metals or their residues for the separation and recovery of their copper content, which comprises treating the material to effect removal of both its iron content and its nonmetallic and other impurities, then casting the remaining material directly into forms adaptable for use as anodes, and then utilizing the same as anodes in an electrolytic bath, whereby the copper content is electrolytically extracted and deposited upon the cathodes.

1,574,792. March 2, 1926. **Metal-Extruding Machine.** Walter R. Clark, Bridgeport, Conn., assignor to Bridgeport Brass Company, Bridgeport, Conn.



In a metal extruding machine, end frames, horizontal tie rods securing said frames together, a billet container supported and guided in the space between the rods for horizontal movement, and means for shifting the billet container into and out of abutment with one of said end frames, comprising a fluid pressure device mounted on top of said end frame and operatively connected by a lever to the billet container.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NEW OIL BURNING DEVICE

The Socony Gasifier is made by the Industrial Division of the Socony Burner Corporation, at 26 Broadway, New York, a subsidiary of the Standard Oil Company of New York. It is said to produce from oil a gas that has all the advantages of adaptability, efficiency and economy which are so important in manufacturing processes. Oil and air are introduced into a specially designed fixation chamber. A patented proportioning valve automatically controls the ratio of the oil and air used, both being operated by the turning of a single handle. Neither is put under great pressure, the air being delivered at about a pound and a half and the oil from a six-foot head (less than three pounds per square inch).

The oil is atomized under low pressure and is injected into a special form of chamber, where velocities of combustion are so controlled that flameless combustion is maintained in a zone saturated with atomized oil. The high temperature of the gases in this chamber completely vaporizes the balance of the oil and it is discharged from the Gasifier in the form of a mixture of fixed gas, saturated with oil vapor. After the primary ignition with a high tension spark the gasifying chamber sustains its combustion by the application and use of special alloy metal fingers in the path of the flame, which, due to the critical temperatures and velocities, and the action of catalysis, makes it impossible to deposit carbon in the gasifying chamber when properly adjusted. This condition of maintaining a blue and almost flameless combustion in an excess of fuel vapor is the point on which the Gasifier is based.

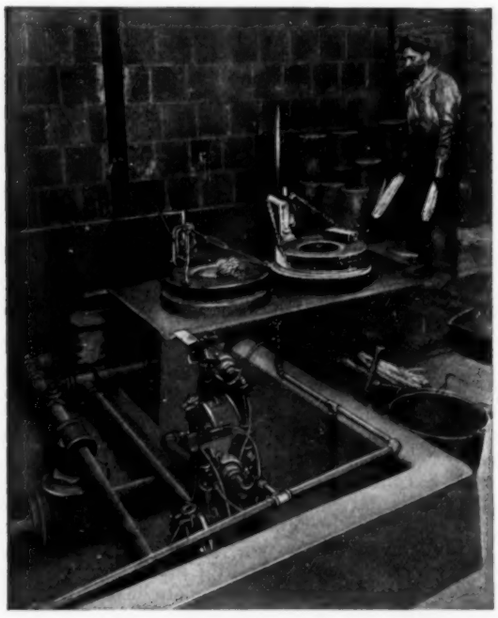


FIG. 1. INSTALLATION IN A BRASS FOUNDRY, SHOWING AN F-5 GASIFIER IN USE WITH BRASS CRUCIBLE MELTING FURNACES

No flame leaves the Gasifier; only a hot gas, saturated with hydrocarbon vapor issuing forth, which may be piped as gas to various heating appliances for the most economical and efficient application of heat in the location desired.

A single heating appliance may be used, or a number can be attached to one Gasifier. This depends upon the capacity of the Gasifier used and the work to be done. The amount of gas generated is easily regulated by the hand wheel which controls the air and oil supply. Two units of capacity are now available, the F-1 Socony Gasifier, which gasifies one gallon of oil per hour, and the F-5, with five times that capacity. Larger heat requirements can be met by multiplying the units.

The Socony Gasifier is adjustable for the use of any grade of oil, from distillate fuel oil 28-31 degrees Baumé to furnace oil of 36-38 degrees Baumé, and up to kerosene. The grade used depends upon the work to be done, the material to be heated, and the nature of the finished product. An adjustment is made to gasify properly the fuel used at the time the Gasifier is installed.

Fuel may be supplied by gravity or by a small pump, the pressure required being only three pounds per square inch. Air supply is provided by a small blower, or the Gasifier can be run from high pressure lines with a suitable reducing valve.

The F-1 Gasifier weighs 15 pounds and is about 8 inches by 2 inches in size. The F-5 Gasifier weighs 40 pounds and its dimensions are about 15 by 3 inches.

Perhaps the most outstanding advantage claimed for the Socony Gasifier is the saving it makes possible in every industry where heating processes are used. And one of the principal and most obvious savings lies in the fuel costs alone.

Fuel Saving,—Comparative Costs: per Million B.T.U.

Electricity
@ 2c/K.W. $5.50
@ 1c/K.W. $2.75
Converted to Heat
City Gas
@ $1.00/1000 cu. ft. $1.75
@ .60/100 cu. ft. $1.00
Oil (Socony Gasifier)
@ 10c/ gallon .76
@ 6c/ gallon .46

The cost of 10 cu. ft. of air per minute at 1½ lbs. pressure should be added to the cost of Gasifier gas for each 1 gallon of oil gasified.

The cost of air for forced combustion in the furnace is about the same in both cases.

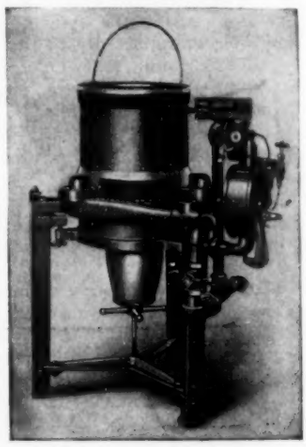


FIG. 2. MELTING FURNACE FOR METALS

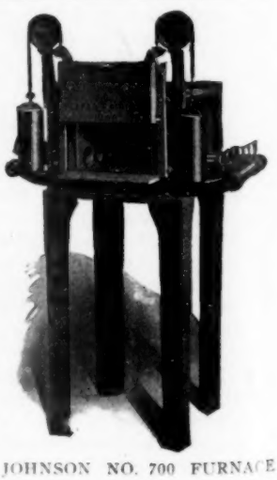
Although the saving in fuel costs has been from 15% to 60%, and higher, in actual practice, it is claimed that the other economies that are possible make the Socony Gasifier a means of lowering production costs even further.

NEW OVEN FURNACE

The Johnson direct jet bunsen burner type oven furnace for carbonizing, hardening, annealing, etc., is claimed to be of strong and durable construction and rapid in operation. The heat can be regulated to a very fine degree up to 2,300 degrees F. without the use of a forced air blast.

The firebox is heavily lined with fire brick. The door is large in size, measuring 7 x 11 inches, balanced by two weights to make opening and closing easy as well as rapid.

The furnace comes equipped with six large size Johnson bunsen burners each with shut-off valves. It is made by the Johnson Gas Appliance Company, Cedar Rapids, Iowa.



JOHNSON NO. 700 FURNACE

NEW ALTERNATING CURRENT POLISHING LATHE

The Crown Rheostat & Supply Company of Chicago has invented a new electric driven polishing lathe and applied for patents on it.

It seems that the alternating electric current is most commonly used and that with the common alternating current frequency of 60 cycles the motor can only be operated at 1,800 r.p.m. or 3,600 r.p.m., one speed being too slow and the other too fast to permit mounting polishing wheels and buffs directly on the motor shaft.

FIG. 1. DOUBLE ARBOR LATHE

The new Crown lathe can be furnished in any speed selected by the purchaser from 1,000 r.p.m. for scratch brushing up to 3,000 r.p.m. for buffing.

This is accomplished by connecting the motor with the 2-inch lathe spindle by means of two specially cut spiral gears of bronze and hardened steel that to the layman will probably be classed with the automobile differential drive gears.

These gears run in oil and the whole operation of the machine is practically noiseless. There are no troublesome belts that slip or endanger workmen.

The main frame of the lathe is cast in one piece forming a platform at the rear for mounting the motor where it is entirely out of the way of the operator. The automatic starting equipment is enclosed in the motor frame so as not to interfere. Pushbutton or manual control can be furnished, the starter being of the very latest design with automatic thermal control to prevent overheating of the motor.

FIG. 2. FRONT VIEW, SINGLE ARBOR LATHE

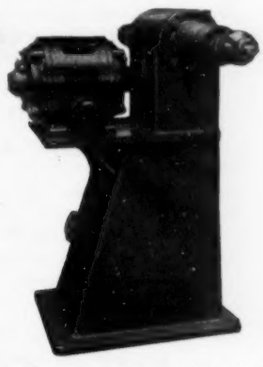


FIG. 3. REAR AND SIDE VIEW, SINGLE ARBOR LATHE

The design of the machine is such that it takes up no more floor space than the ordinary lathe and gives the polisher the same freedom of movement.

Bulletin No. 112 describes this lathe in full detail and will be sent on request.

FLASK PIN POLISHER

Joseph Dixon Crucible Company of Jersey City, N. J., has placed on the market a flask pin polisher. This is a device made and shaped especially to keep the pins of foundry flasks smooth and free from rust so that they will slip easily into their sockets without sticking.

DIXON FLASK PIN POLISH

In this way, the pins are kept in a bright, clean condition, ready for immediate use, thus eliminating one of the small but irritating difficulties in the foundry, which are often accountable, to a surprising degree, for low production records.

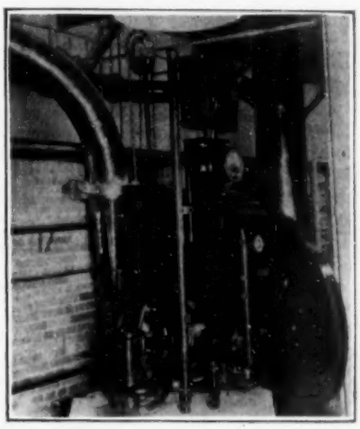
NEW DESIGN COMPRESSOR

The Champion Porcelain Company, Detroit, has installed a new design of centrifugal compressor for supplying air to oil burning furnaces. This compressor, built by the General Electric Company, delivers 1,800 cubic feet of air per minute to the furnaces at a pressure of 1½ pounds per square inch gauge and operates at a speed of 3,450 r.p.m., directly connected to a 20-horsepower, 3-phase, 60-cycle, 220-volt, 3,600-r.p.m. induction motor.

The motor is controlled by a General Electric hand compensator which brings the compressor quickly up to speed, keeping the time and current required for starting at a very low value.

One of the features of the installation is that the operator can tell at a glance the volume of air being delivered to the oil furnaces and the corresponding current input, by means of a special, calibrated scale on the ammeter. This scale is calibrated in amperes and volume (cubic feet of air per minute).

By means of this plan the Champion Porcelain Company can determine the operating cost of this part of its plant very accurately. From an operating standpoint, it enables the user to set any desired volume of air to the furnace simply by adjusting the blast gate, which is a valve in the air line. Regulating the opening of the blast gate will vary the volume of air delivered by the compressor. Thus all the operator has to do is to adjust the blast gate until the desired volume of air is indicated.



CENTRIFUGAL AIR COMPRESSOR

HIGH SPEED BRASS ROD

The Scovill Manufacturing Company of Waterbury, Conn., has developed its High Speed brass rod to meet the demands of present day screw machine operation.

The strongest point claimed for Scovill rod is its uniformity. As every operator knows, it is the hard spots and the occasional hard rods which raise havoc with the adjustment of the tools and the life of their cutting edges. To obtain uniformity they have placed the manufacture of this product strictly under laboratory control. This means adherence to the correct composition (every heat of metal receives a chemical analysis), testing the pouring temperature of the metal with a pyrometer before it is poured from the electric furnaces, care in extruding, accuracy in annealing, and inspection of the product.

EQUIPMENT AND SUPPLY CATALOGS

Socony Gasifier. A new device for oil burning furnaces. Industrial Division of the Socony Burner Corp., New York.

Power Factor and Means for Its Improvement. General Electric Company, Schenectady, N. Y.

Zinc and Its Corrosion Resistance. American Zinc Institute, New York.

Madison Square Garden. One of New York's Architectural Landmarks. American Institute of Steel Construction, New York.

Arbitration. Information Bulletin No. 1. American Arbitration Association, New York.

Forging Machine Talk No. 55. National Machinery Company, Tiffin, Ohio.

The Bonus and the Budget. Metropolitan Life Insurance Company, New York.

Double Slide Angle Plate Grinder. Hisey-Wolf Company, Cincinnati, Ohio.

Safety Washer for Grinding Abrasive Wheels. George W. Perks Company, Akron, Ohio.

Plumbers Brass Goods; Installation and Protection. National Association of Brass Manufacturers, Chicago, Ill.

Motor Driven Co$_2$ Recorder. Republic Flow Meters Company, Chicago, Ill.

C. E. Unit System for Burning Pulverized Fuel. Combustion Engineering Corporation, New York.

Annual Report of the American Telephone and Telegraph Company for the Year 1925.

Capacitors. More Power Over the Same Line. General Electric Company, Schenectady, N. Y.

Arguto Oilless Bearings. Arguto Oilless Bearing Company, Wayne Junction, Philadelphia, Pa.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN ELECTRO-PLATERS' SOCIETY

HEADQUARTERS, CARE OF R. STEUERNAGEL, TREASURER, 1508 CONCORDIA AVE., MILWAUKEE, WIS.

CONVENTION PROGRESS

The fourteenth Annual Convention of the American Electro Platers' Society will be held at Salaam Temple in Newark, N. J. from June 28-July 1, 1926. Five hundred Delegates are expected to attend this big convention. It is expected to accommodate 1,000 at the banquet.

The convention program thus far outlined will comprise afternoon and evening sessions on the first day—Monday—three sessions on Tuesday, visits to industrial plants on Wednesday and the annual meeting and election of officers on Thursday, with a banquet at the close.

Oliver Sizelove of 919 Chancellor avenue, Irvington, N. J., chairman of the education committee in charge of the program for the convention, announced that arrangements had been made for eighteen papers to be read, covering various phases of electro-plating. These papers may be printed for distribution prior to the sessions so as to permit more time at the convention for discussion of the various topics.

George Reuter of 48 Thirty-eighth street, Irvington, N. J., president of the society, is chairman of the banquet committee. George Onkson of 1196 Long avenue, Hillside, N. J., vice-president, is chairman of the reception committee, and Fred W. Matts of 55 Concord avenue, Hilton, N. J., is acting in a general secretarial capacity for all of the various committees.

The Elks Club have about fifty rooms for single men, available to delegates attending the Convention. Anyone wishing to engage one of these rooms had better reserve it now. There is a special rate for them, though the rate cannot be published. The Elks Club is very handy to the Convention hall, and they will throw open their Club rooms to delegates of the Society.

The following firms have so far signified their intent to exhibit their products: Hanson & Van Winkle Company, Newark, N. J.; A. P. Munning and Company, New York; Maas and Waldstein Company, New York; Egyptian Lacquer Company, New York; MacDermid Company, Waterbury, Conn.; Connecticut Dynamo & Motor Company, Irvington, N. J.; Pittsburgh Plate Glass Company, Pittsburgh, Pa.; J. B. Ford Company, Wyandotte, Mich.; Matchless Metal Polish Company, Glen Ridge, N. J.; Zapon Company, New York; Raritan Copper Works, Perth Amboy, N. J.; Magnus Chemical Company, Brooklyn, New York; Oakley Chemical Company, New York; Miner Edgar Company, New York; Daniels & Orben Company, New York.

BRIDGEPORT BRANCH

HEADQUARTERS, CARE OF R. J. O'CONNOR, 1228 NOBLE AVENUE

The Eighth Annual Banquet of the Bridgeport Branch of the American Electro-Platers' Society will be held at the Hotel Stratfield on April 24, 1926. A very fine speakers' program will be given including the moving picture of copper from mine to consumer, with a lecture by Mr. S. Skowronski at 3 P. M.

Dinner and dancing at seven P. M.

All those desiring further information and tickets address, R. J. O'Connor, chairman, at the above address.

CHICAGO BRANCH

HEADQUARTERS, CARE OF ROBERT MEYERS, 2210 WILSON AVE.

At the Annual Banquet held on January 23, 1926, according to a late report, the following prizes were distributed:

Table lamp, donated by	Mr. R. J. Hazucha
won by	Mrs. C. P. Carlson
Table Matts, donated by	Mr. F. L. Greenwald
won by	Mrs. J. W. Hanlon
Vanity bag, donated by	Mr. E. Howard
won by	Mrs. F. J. Hanlon
Dinner ring, donated by	Mr. H. Gilbertson
won by	Mrs. R. J. Hazucha
Waffle iron, donated by	Mr. E. V. Allen
won by	Miss Ellen Servis
Pillow slips, donated by	Mr. S. E. Huenerfauth
won by	Mrs. Jerry De Grazio
Curling iron, donated by	Mr. Jno. C. Kretschmer
winner's name not obtained.	
Perfume Atomizer, donated by	Mr. N. P. Hunter
won by	Miss E. Humphries
Perfume Atomizer, donated by	The Branch
won by	Mrs. Ralph Flannigan
Five dollars cash, donated by	Mr. E. Lamoureux
won by	Mrs. E. Lamoureux

NEWARK BRANCH

HEADQUARTERS, CARE OF F. W. MATTS, 55 CONCORD AVE., HILTON, N. J.

At the meeting on March 5, 1926, 40 members were present and a most interesting discussion was held on chromium plating.

A delegation of 10 members of the New York Branch visited the meeting and voiced the appreciation of the New York Branch for the friendliness of Newark in providing such a large attendance at the New York Banquet.

NEW YORK BRANCH

HEADQUARTERS, CARE OF J. E. STERLING, 468 GRAND AVENUE, ASTORIA, LONG ISLAND, N. Y.

The February meetings of the New York Branch of the American Electro-Platers' Society were well conducted and both meetings had a large attendance.

Report of Chairman of Banquet Committee, Franklyn McStocker, was the feature of first meeting, said report showing that the banquet was grand success.

The second meeting featured Joseph Downs, who gave an excellent address on Modern Silver Plating, describing in detail all up to date methods employed by factory (E) of the International Silver Company of Meriden, Conn. Mr. Downs was given a rising vote of thanks by the Branch.

AMERICAN ELECTROCHEMICAL SOCIETY

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK

The American Electrochemical Society will hold its Annual Convention at the Chicago Beach Hotel, April 22, 23 and 24, 1926.

One session of the meeting will be devoted to papers on Electrolytic Refining and Plating of Metals.

Dr. H. S. Rawdon, physicist of the Bureau of Standards, will present results on the protective action of cadmium on iron and steel. In general the experiments indicate that cadmium stands in the same relation to iron as zinc. H. E. Haring, Associate Chemist, Bureau of Standards, will outline a Simple Method for Measuring Polarization and Resistivity. Messrs. H. C. Parker and W. N. Greer, of the Research Dept., Leeds & Northrup Co., have investigated the use of the Quinhydrone Electrode in Nickel Plating Baths. They have developed an exceedingly easy and accurate method for the control of the acidity of nickel baths.

The luncheon Thursday noon will be devoted to Round Table Discussions: one on the Selection of Proper Plating Metals, at which F. J. Liscomb, of the Hanson & Van Winkle Company, will preside; the other on Comparative Merits of Electric and Fuel-Fired Furnaces, in charge of Wm. J. Priestley, of the Electrometallurgical Corp.

AMERICAN ZINC INSTITUTE

HEADQUARTERS, 27 CEDAR STREET, NEW YORK

The annual meeting of the American Zinc Institute will be held at the Hotel Coronado, St. Louis, Mo., April 19-20, 1926. Among the papers read will be one by C. L. Patterson on the plans of the steel mills for the promotion of the sale of galvanized sheets. Captain J. A. Stader of the Bureau of Mines will report on the progress made in simplifying practice in the zinc industry.

AMERICAN WELDING SOCIETY

HEADQUARTERS, 33 W. 39TH STREET, NEW YORK

The Annual Meeting will be held April 21-23, 1926 at the above address. Among the subjects to be discussed is the arc welding of non-ferrous metals and the results of tests on the fundamentals of arc welding.

Personals

CHARLES R. SPARE

On page 174 of this issue is an announcement of Charles S. Spare's resignation from the American Manganese Bronze Company of Holmesburg, Philadelphia, Pa., and new connection with the Janney Cylinder Company of the same city.

Charles R. Spare, metallurgist, was born in Montgomery County, Pennsylvania, educated in the schools of Philadelphia and graduated in 1901 from the University of Pennsylvania with the degree of B.S. in Chemistry. He studied under Dr. Edgar F. Smith and specialized in electro-chemistry and metallurgy.

After serving a short period as assistant chemist in the testing laboratory of the General Electric Company at the Schenectady Plant, he engaged in metallurgical work in the West, in the reduction and concentration of ores and the cyanide process.

In 1903, he was selected by the William Cramp & Sons Ship & Engine Building Company of Philadelphia, Pa., as Chief Chemist and Engineer of Tests, in charge of analyses and tests of all materials entering into battleship construction. During the next five years the investigation and production of high tensile strength bronzes became of great importance to the engineers and their successful manufacture and application contributed to the rapid development of the modern warships with their great speed and heavy ordnance, the huge hydraulic turbines harnessing our water power, the automobile, the airplane and many other notable engineering achievements.

CHARLES R. SPARE

In 1908, after perfecting several new types of high tensile strength manganese bronzes, which exceeded any heretofore produced, Mr. Spare organized the American Manganese Bronze Company, in conjunction with U. T. Hungerford, Russel A. Cowles and others prominent in the metal industry in New York. He planned and equipped the plant at Holmesburg, Philadelphia, and was first elected Vice-President and later President and General Manager in charge of production. He held this post for eighteen years. During this period, this company undertook and completed successfully some of the largest and most important contracts ever placed for difficult bronze castings and forgings, including those in the Panama Canal, the Catskill Aqueduct, most of the large U. S. Reclamation Service dams in the West, the Erie Barge Canal and many important war contracts for ordinance and propellers.

After the successful use of these new bronzes with high tensile and compressive properties and with great density to hold heavy pressures, it was determined to extend their application and to find new uses for these valuable metals. In conjunction with W. T. Janney there was developed and patented the Janney Pressure Process for making cylindrical castings of great density, applicable also to practically all the non-ferrous metals.

On Feb. 1st, 1926, Mr. Spare resigned from the American Manganese Bronze Company in order to assume the sales management of the Janney Cylinder Company of Holmesburg, Phila. and also to engage in consulting metallurgical practice, specializing in the production of high test bronzes and the solution of non-ferrous metal foundry problems. His office and laboratory are located at 7425 State Road, Holmesburg, Phila.

Mr. Spare is a member of American Society for Testing Materials, American Institute of Mining & Metallurgical Engineers, the Engineers' Club, and is president of the Philadelphia Foundrymen's Association.

F. L. Dalzell has been appointed Cleveland district sales manager of the Ohio Injector Company, Wadsworth, Ohio, which has opened offices at 301 National Building, Cleveland.

W. R. Webster, vice-president of the Bridgeport Brass Company, Bridgeport, Conn., was away for more than a month on a trip to Panama and returned to the office in March.

J. R. Lower, 12 Washington avenue, Mansfield, Ohio, resigned as chemist with the Ohio State Department of Health,

to accept a position with the Ohio Brass Company, Mansfield, Ohio, in the technical department.

Charles C. Phelps, secretary and sales manager of the Uehling Instrument Company, Paterson, N. J., has just completed a ten weks' trip visiting all of the company's southern representatives as well as several in the middle west.

John V. Calhoun, formerly engineer of furnace construction with Combustion Engineering Corporation, New York City, has taken up his new duties as sales manager with Harold E. Trent, manufacturer of electrical heating and temperature control appliances, Philadelphia, Pa.

Noah F. Young, president and treasurer of Lumen Bearing Company, Buffialo, N. Y., has been re-elected to these positions and named general manager as well. **C. H. Bierbaum** was elected vice-president, and **N. K. B. Patch** secretary. The directors, in addition to the above, are: **A. G. Bartholomew** and **Samuel Ellis.**

L. M. Terry has been appointed factory manager of Bruce Products Corporation, Detroit, Mich., which recently purchased a new plant in Howell, Mich., and is now in full operation. Production on polishing compositions, cotton buffs and polishing wheels is now at a higher scale than at any time since the company entered this field.

F. M. Burt has joined the sales force of the Massillon Refractories Company, Massillon, Ohio. He will be located at Pittsburgh and will have charge of the placing of "Alumite" refractories in the vitreous enameling industry. Mr. Burt was formerly an enamel specialist with the Trumbull Steel Company; also with the Carborundum Company.

Joseph J. McCaffrey has been appointed manager of the McKenna Brass & Manufacturing Company's branch at Chicago, Ill., which serves the trade in Illinois, Iowa, Wisconsin and Minnesota. Mr. McCaffrey was formerly associated with the Bishop & Babcock Company of Cleveland, Ohio, as manager of the bottling machinery department, and also representative in St. Louis territory.

Joseph Fay is now representing the McKenna Brass & Manufacturing Company, Pittsburgh, Pa. He will travel Western New York and Northern Pennsylvania. Mr. Fay was formerly connected with the Bishop & Babcock Company, and later with the Newman & Fay Company of Cleveland. He has long been identified with the bottling industry and enjoys a wide acquaintance among bottlers.

W. T. Clark has recently been appointed factory manager of the J. W. Paxson Company, foundry equipment manufacturers, Philadelphia, Pa. Mr. Clark is a well known operating executive, having done very efficient work for the General Electric Company, Otis Elevator Company, Fairbanks, Morse & Company and others, and has a wide acquaintance in the machine tool building and other metal industries.

Karl B. Thews was formerly plant manager in charge of all operations, except mining, for the Keystone Metals Reduction Company, Cheswick, Pa., manufacturer of radium, vanadium and uranium. This company was forced to shut down like all other radium companies, due to the Belgium Congo radium ore discoveries. Mr. Thews is now vice-president and general manager for the Pittsburgh Lacquer & Chemical Company, Pittsburgh, manufacturers of vitro cellulose lacquers, and secretary and treasurer for the American Chemical Company, Pittsburgh, Pa.

Mr. Brill represented and was in charge of the Thwing Instrument Company exhibit at the annual meeting of the American Ceramic Society in Atlanta, Georgia. While enroute from Atlanta to New Orleans, Mr. Brill was taken suddenly seriously ill at Birmingham, Alabama, and was removed from hotel to hospital in Birmingham, and confined with influenza and pneumonia. After being in the hospital for a period of about two weeks, he was removed to his home in Philadelphia, where he is now convalescing. Mr. Brill's recovery has been quite rapid in view of the fact that he suffered such a severe illness and he will be at his desk again shortly.

James F. Miller was president and general manager of the Miller-Hurst Corporation of Detroit, specialists in production methods and equipment for foundries and factories and also president and general manager of the Interstate Foundries, Inc., which operate foundry and machine plants at Cleveland, Ohio, and Clearing, Illinois, has resigned from the latter position. When Mr. Miller, in addition to his other duties, took over the executive responsibilities of the Interstate Foundry, Inc., a year and a half ago, the plants were inoperative as a result of the company's having gone through receivership. Under Mr. Miller's direction the plants were revamped and put in condition for economical operation, a sales force and two plant organizations were developed, and the business put on a substantial basis, with both plants working to capacity. After a month's rest Mr. Miller will devote his entire energies to the Miller-Hurst Corporation of which he was one of the founders.

Obituaries

DANIEL M. BRADY

Daniel M. Brady, whose death was noted in our March issue, was born May 6, 1854. In December, 1871, he entered the employ of the New York Central and Hudson River Railroad.

DANIEL M. BRADY

Of the more than 700 men who were in the employ of the company in the Grand Central Depot on December 1, 1871, the Hon. Chauncey M. Depew is the only one now living and in active railroad service. Mr. Brady continued in railroad service for a great many years, finally retiring to establish the Brady Brass Company of Jersey City, N. J. This company specialized in the production of car boxes and general railroad and industrial bearings, and built up an extensive business in this field.

Mr. Brady was a member of the New York Railroad Club, the 7th Regiment, the Friendly Sons of St. Patrick, the New England Railroad Club, and the Master Car Builders' Association.

GEORGE F. OTT

George F. Ott, whose death was noted in our January issue, shortly after coming to this country from Switzerland became chief engineer of a well known concern manufacturing textile machinery and later became the partner of J. Trotman, who was operating a coppersmith shop on a very small scale, having but two employees. This was in 1870.

After the partnership was formed, under the name of Trotman & Ott, George F. Ott constructed and developed apparatus on a larger scale, for the brewing industry as well as the tanning and milk industries, and from there branched out into larger fields, manufacturing equipments for over 125 different industries.

In connection with the copper work which he built at the time, the equipment entailed other lines, such as millwright work, steel tank work, etc. He was known to the trade from coast to coast as being absolutely fair to his clients and had always maintained the high reputation which he enjoyed, both as to fairness and as to the quality of the work.

On July 1, 1916, he sold his interest and the business was incorporated under the name of George F. Ott Company. He acted, for a very short time, as its president, with John Limprun, vice-president and O. Guessefeldt, secretary. Shortly afterward he withdrew entirely and the business was carried on by John Limprun, president and treasurer, and O. Guessefeldt, vice-president.

MARTIN SCHEELER

Martin Scheeler, president of the Buffalo Wire Corporation, died at his home in Buffalo, March 1, 1926. He was 63 years old.

Mr. Scheeler was also a director of the Buffalo Galvanizing & Tinning Works.

Martin Scheeler was the son of Martin Scheeler, Sr., and Anna Marie Steckenreiter, both from Germany, born on April 29, 1863, in the city of Buffalo. He was educated in the Buffalo public and parochial schools, and at the age of seven was a student of music, and his interest in that art continued all his life.

At the age of twenty, Mr. Scheeler entered the jewelry business with Hotchkiss Company, in the city of Buffalo, becoming a expert watchmaker and repairer. When twenty-two years old he entered the wire business with his father, the originator of the present firm bearing the name of Buffalo Wire Works Company, and his brother Philip Scheeler, the firm then being known as Scheeler & Son, Buffalo Wire Works.

He was married in 1886 to Anna Seifert, and was the father of two daughters, Mrs. Frank X. Bennet, and Mrs. Dante J. Morgana, and two sons, Edward M., deceased, and John C. Scheeler, secretary and assistant treasurer of the Buffalo Wire Works Company.

CONRAD A. HAERTEL

Conrad A. Haertel died at his home in Waukesha, Wis., on March 2, 1926. He was one of the most prominent industrial leaders in Wisconsin and founder of several large metal-working plants. Mr. Haertel was born in Germany on September 21, 1851. His family emigrated to the United States in 1856 and settled in Waukesha, where Mr. Haertel, Sr., was engaged in the hardware business until his death, after which the son continued the business. In 1900 he laid the foundation for the first of his industries, the Waukesha Malleable Iron Company, which a few years ago was acquired by the General Motors Corporation. In turn there were founded the Spring City Foundry Company, the Waukesha Motor Company, and the Waukesha Brass Foundry. A year ago, Mr. Haertel became chairman of the board after serving as president of the motor company since organization. He also served as director of the several foundry companies, and the Waukesha National Bank.

PHINEAS F. PARSONS

Phineas F. Parsons, 91, died March 25, in Providence, R. I., following a brief illness of pneumonia. He had been connected for more than 60 years with the brass industry in New England. Mr. Parsons had lived in Providence for upwards of 40 years. He was born in Northampton, Mass., October 8, 1835. He leaves two sons, Edmund H., and Frank R. Parsons, of Providence, and two daughters, Mrs. C. S. Smith, of 170 Brown street, Providence, with whom he made his home, and Mrs. F. P. Maxwell, of Rockville, Conn.

E. L. SPENCER

Everett L. Spencer, a leading manufacturer of jewelry, died recently at the age of 59. He was Past President of the New England Manufacturing Jewelers and Silversmiths' Association, a director of the Manufacturing Jewelers' Board of Trade, and held office in various other organizations. He also was a 32nd degree Mason. Mr. Spencer was born in 1867 in Providence, R. I., and entered a jewelry factory at the age of 13 to learn the trade. When he was 25 years old he was sole owner of a manufacturing jewelry concern. His wife and two daughters survive him.

FRANZ ROESSLER

Franz Roessler, aged 63, President of the Roessler & Haaslacher Chemical Company of New York, died in Perth Amboy, New Jersey, in March, 1926. He is survived by his widow and several children. Mr. Roessler had recently returned from Europe, where he went in an attempt to regain his health.

GEORGE M. VAN DEVENTER

George M. Van Deventer, treasurer of the Waterbury Clock Company, 30 Irving Place, New York, and with that company for over fifty years, died recently, in his 85th year, at his home, 5 Plaza street, Brooklyn, N. Y. Mr. Van Deventer was an active church worker.

EDWARD NEVILLE TODD

At his home in Short Hills, Edward Neville Todd died recently, after an illness of two or three months. He was 68 years old, and until recently was president of the Hanson & Van Winkle Company, Newark, N. J.

LIEUT. JOHN ALBERT TOBIN

Lieut. John Albert Tobin was buried on February 3, 1926, from his home in Providence, R. I. He was born in Rhode Island, August 31, 1849. Lieut. Tobin was inventor of Tobin bronze.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

April 1, 1926.

All last year's officers and directors of the **Chase Companies, Inc.**, were re-elected at the annual meeting of stockholders and directors of the company, held here, last month. **Frederick S. Chase** continues to head the concern as president.

At the stockholders' meeting the following directors were chosen: **F. S. Chase, Irving H. Chase, Arthur Reed Kimball, R. L. Coe, Richard D. Ely, F. A. Jackle** and **Rodney Chase.** The directors re-elected the following officers: President, **F. S. Chase**; vice-president, **I. H. Chase**; treasurer, **R. D. Ely**; secretary, **R. L. Coe**; assistant secretary, **Charles E. Hart, Jr.** As the concern's stock is all closely held by the Chase family, no report of operations has been made public.

Charles F. Brooker, re-elected last month as chairman of the board of directors of the **American Brass Company**, who has been ill in his hotel in New York for some weeks, left for Florida on a trip for his health, last month. He had been ill since his return from a trip to Porto Rico about two months ago and was advised by his physician to go south to recuperate. It is expected that he will remain there for about two months. He had been receiving special treatment from a New York specialist. While in Florida, it is expected that he will stay in St. Augustine.

Employes of the **Waterbury Clock Company** are unaffected by "scare" stories in the metropolitan press describing the terrible deaths suffered by clock workers in the radium room of a New Jersey clock shop. Work in the radium room consists of painting luminous figures on the dials of watches and clocks. Such work is carried on by the local company, but according to the officials, there is absolutely no danger of infection unless the brush is put into the mouth for shaping. Every precaution is taken in the local plant to prevent this practice.

The local brass companies and officials have played a large share in organizing and supplying the capital for the **Waterbury Second Mortgage Company, Inc.**, last month, under the auspices of the Chamber of Commerce for the purpose of helping wage earners and small salaried men own their own homes. The largest stockholders in it include the **American Brass Company, Chase Companies, Inc., Scovill Manufacturing Company, Connecticut Light & Power Company, John P. Elton, John H. Goss, Mayor Francis P. Guilfoile** and **ex-Gov. C. A. Templeton. A. R. Kimball** is the president.

Edwin R. Snagg, 59 years, the oldest employe of the **Blake & Johnson Company,** died March 8, his death being due to high blood pressure. He was the company's engineer and a member of the National Association of Stationary Engineers.

John H. Goss, vice-president and general superintendent of

the **Scovill Manufacturing Company,** was elected a director of the Eastern States Agricultural and Industrial League and a member of the executive committee at the annual meeting of the organization in Springfield, last month.

A trade-mark for rods, sheets, wire, plates and other brass articles has been registered for its Ansonia plant by the **American Brass Company,** according to last month's patent office report.

Edward O. Goss, president of the **Scovill Manufacturing Company,** was one of the speakers at a meeting of the commercial and industrial leaders of Connecticut, held at New Haven, March 22, under the auspices of the State Chamber of Commerce to forward aviation development, particularly transportation by the air in the state.

More consolidation rumors, which recur periodically since the **American Brass-Anaconda** merger and the later acquisition of small plants by the **Scovill Manufacturing Company,** were stirred up again last month and denied, or else unconfirmed, died a natural death. One was that the Citizens' & Manufacturers' National Bank, in which the Scovill company interests are largely involved, and the Waterbury National Bank, in which the Chase companies interests are still more largely represented, were to be merged shortly and that this would be a preliminary to the often talked of merger of the Scovill company and the Chase companies. Officials of the banks mentioned, while admitting that they knew talks of such a merger were in the air, declared the subject had never been mentioned at any of the directors' meetings and so far as they knew nothing of the sort is being contemplated by any of those principal directors. Some such merger may come about in time, one of the officials said, but there is nothing tangible at the present time on which to base such an expectation.

The other rumor was that the **Scovill Manufacturing Company** was about to acquire or merge with the **Waterbury Button Company** and also, possibly, the **Waterbury Buckle Company, Steele & Johnson Company, Smith & Griggs Company** and the **Mattatuck Manufacturing Company.** All of these companies manufacture brass articles or articles in which considerable brass is used. Within recent years the Scovill company has purchased a number of somewhat similar plants that use considerable brass in the manufacture of their products, the chief reason being, it is understood, to assure itself of a market for its brass with those companies. These concerns acquired have been the **American Pin Company** and **Oakville Company** of Waterbury, **Hamilton-Beach Company** of Racine, Wis., **Morengy-Van Buren Company** of Sturgis, Mich., and the **Gilchrist Manufacturing Company** of Newark, N. J. Rumors of these latest possible mergers, however, were declared to be absolutely without foundation by the officials of the companies involved. They said so far as they knew, no negotiations for such mergers are contemplated.—W. R. B.

BRIDGEPORT, CONN.

APRIL 1, 1926.

Although the title to the plant of the **American Tube & Stamping Company** on Hancock and Railroad avenues has been transferred by a warranty deed, filed in the town clerk's office, from the Equitable Trust Company to the Connecticut Steel Corporation, it does not represent a sale, according to Ellis M. Johnson, vice-president of the latter company. When the Tube company was formed in 1902, bonds were issued, secured by a mortgage of $150,000, to mature in 1902. The Connecticut Steel corporation was formed at the time as a holding company and when it was desired to reassume full title to the property it was found necessary to make the release through a third party. No further transfer from the Steel corporation to the Tube company will be made, Mr. Johnson says, as it will be unnecessary as the two companies are practically the same.

The **International Silver Company,** having failed to secure any reduction in assessment from the board of relief, has filed notice of an appeal in the Superior Court. It listed its property at $673,382 and the tax assessor set its value in the tax list at $888,537. This valuation has been sustained by the board of relief. On the previous grand list the company was assessed for $953,570, having declared its property to be worth $638,582.

The plant and equipment of the **Gaynor Manufacturing Company,** which has been in the hands of a receiver for three years, was sold at auction, last month, under an order of the Superior Court for the sum of $37,760. Those buying it represented the interests of the Gaynor brothers. The assets consisted of land, buildings and considerable machinery, all of which are covered by two mortgages, one of $26,000 and the other of $32,000. The sale is the culmination of a suit for damages brought by the **Remington Arms Company** against the Gaynor company for violation of contract. Damages of $44,416 were awarded and the company sought to put a lien on the property for the judgment but it was found that the two mortgages held by the City National Bank took precedence.

Experimental work on a new **Columbia** phonograph, in line with the most recent developments in the industry, is now being brought to conclusion. It is entirely of local manufacture and is covered by a number of patent applications. The diaphragm tone arm, soundbox and amplifying chamber mark an entirely new departure in phonograph construction and, it is claimed, will reproduce individual voices and instruments as well as choruses and orchestras in a more lifelike manner than any previous models. Part of the West End plant of the Columbia Phonograph Company has been leased to the **James J. Desmond Company, Inc.,** through the office of the Industrial Bureau.

The **Challenge Cutlery Corporation,** organized in 1899, will close its business within a few months. Announcement has been made that the plant at Kossuth and Seymour streets is for sale. Plant and equipment is assessed at $200,000. It has held a high reputation in the making razors, knives and shears. At present but 100 hands are employed. The factory is three stories high. The officers are: President, **P. L. Van Alstyne;** vice-president, **C. F. Wiebusch;** secretary and treasurer, **William E. Primrose.**

The task of distributing the stock given employes of the **Crane Company** at Christmas time as a present from **Robert Crane** was started at the local plant, yesterday. More than 8,000 shares were given to all employes who had been with the concern for more than 10 years, one share for each year. Each share has a present market value of $58, making the total value of the stock given away in all the Crane Company plants over $450,000.—W. R. B.

TORRINGTON, CONN.

APRIL 1, 1926.

There is no slowing up of activities in the metal plants in Torrington. Orders are coming in well, there is plenty of work at good wages and the shops generally are working full time with one or two working on overtime schedules. An executive in close touch with the manufacturers here predicted to THE METAL INDUSTRY representative several days ago that the present year would be one of the most prosperous in the history of the community.

So far as the labor situation is concerned there is a noticeable scarcity of skilled labor both here and in adjoining towns, but the supply of unskilled labor is adequate.

Among the Torrington manufacturers who have returned from sojuorns in Florida are: **Thomas W. Bryant,** of the **Union Hardware Company,** and **Charles H. Alvord,** of the **Hendey Machine Company.**

Arthur Hendey, who was associated with his brother, the late **Henry J. Hendey,** in founding the **Hendey Machine Company** in Torrington in 1870, died March 8 in Prescott, Ariz., after a long period of ill health. He was 80 years of age. One daughter is the only immediate surviving relative. The Hendey Machine Company was founded as Hendey Brothers and has grown steadily throughout the 56 years of its existence. Arthur Hendey disposed of his interests in the company to his brother after it was reorganized as a stock company in 1875.

The **Plainville Castings Company,** at Plainville, established about five years ago by former Torrington men, suffered a loss of $50,000 recently when a section of its plant was

destroyed by fire. The chief organizers of the company were **William Stewart** and **H. S. Washburn,** formerly associated with the **Turner & Seymour Manufacturing Company.**—J. H. T.

NEW BRITAIN, CONN.

April 1, 1926.

The incident of outstanding interest in the metal manufacturing industry here in New Britain this past month was the announcement by the **Stanley Works** of the purchase of a large manufacturing plant at Velbert, Rhineland, in the Ruhr district, Germany. The plant was owned by **Friedrich Carl von Bruck** and was one of the Stanley Works' chief export competitors. Recently the Stanley Works took an option on a plant at Brussels, Belgium, but has allowed it to lapse and will not buy it.

The recently purchased German factory employs about 500 hands, has been in operation about 25 or 30 years and has been doing a large business in the Far East, Mexico and Cuba. It manufactures a complete line of hinges as well as bolts, casters and kindred articles. The American owners already have taken possession of the factory and **John C. Cairns,** of Waterbury, Conn., has been placed in charge. Mr. Cairns is a graduate of Yale and the Harvard school of business administration.

The quarterly and annual meetings of several of the leading concerns have been held but nothing of importance took place. At **Landers, Frary & Clark, H. R. Owen,** formerly hardware sales manager, was made a vice-president and at the **North & Judd Manufacturing Company, Raymond Sullivan,** general manager and vice-president, retired at the conclusion of a three-year contract. He was succeeded by the man whom he himself had supplanted, **Michael F. O'Hayer.** Mr. O'Hayer, now, is active general manager. It was the annealing plant of this concern that collapsed in February with the death of eight men. Since then the prosecuting authorities have given the factory a clear bill, holding that the collapse was brought about by natural events over which the concern had on power. Although the stock of this firm has slumped rather badly during the past few months, business conditions, it is said, do not reflect anything but an encouraging outlook.

The various branches of the **American Hardware Corporation** all seem to be satisfied with existing business conditions and the outlook for spring and summer business is said to be favorable.

Allen Chamber McKinnie, sales manager at the **Stanley Works,** to whom he came in 1897, died on March 15, after a lingering illness. Mr. McKinnie was 52 years of age and early in his hardware business career was with the Simmons Hardware Company, of St. Louis. He was well known throughout the hardware trade.—H. R. J.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

April 1, 1926.

Contrary to expectation there is little or no change in the industrial situation in Rochester and immediate vicinity. In fact, activities in some directions appear to have been somewhat curtailed since early last month, and diligent inquiry fails to uncover anything in the way of encouragement for the month of April or the immediate future.

The only avenue of industry that displays real prosperity is that occupied by the brass foundries and electric-plating establishments here and there. Business in specialties, small orders, new building materials, brass and aluminum attachments, etc., are very firm and all plants are operating at what might be termed "full blast." There is not an idle brass molder or worker in Rochester, and, in fact, that claim goes for most men associated in the non-ferrous metal departments.

Outside of the **General Railway Signal** and **Todd Protectograph Company** plants most manufacturing concerns are running at from 70 to 80 per cent capacity. In many ways the latter figure is quite satisfactory, but it hardly averages up to business conditions of a year ago. Not so much metal is employed at the extensive **Eastman Kodak Works** as in former years, inasmuch as more attention is now given to the production of film by the Eastman company. Newly-invented cameras, however, will stimulate production in the mechanical end. —G. B. E.

NEWARK, N. J.

April 1, 1926.

It transpired before Vice Chancellor Backes that a receivership proceeding brought by **Colin J. Campbell** on February 28 against the **Standard Tool and Signal Company,** of 119 Sussex avenue, Newark, was in the nature of a "false alarm." The defendant concern denied the allegations of insolvency set out in a bill. No judgments are outstanding against defendant, and the defendant's assets exceed its liabilities by approximately $2,000. The vice chancellor accordingly dismissed the proceeding.

Following Newark concerns have been incorporated: **Superior Lamp and Automotive Equipment Company, Inc.,** of New Jersey, 999 shares, no par, deal in automobiles and conduct a foundry to make factory supplies. Incorporators: A. B. Fulterman, Henry Fulterman, Meyer Fulterman, Newark.

Warner Brothers, Inc., 1,000 shares, no par, to manufacture locks; **Muller & Seitel, Inc.,** $500,000 capital, to manufacture hardware; **Taubman's of New Jersey,** 200 shares, no par, to manufacture radio and electric equipment; **Newark Pattern Works,** $125,000 capital, manufacture castings.—C. A. L.

TRENTON, N. J.

April 1, 1926.

Some of the metal industry plants in Trenton report a falling off in business during the past month, while others continue busy. The **Jordan L. Mott Company** is not as busy as it was during January, but expects that business will pick up shortly.

After working six years on a fifty-hour week schedule the **Keystone Watch Case Company,** of Riverside, N. J., has stated on a schedule of forty working hours a week. The company's new manager, **George Soence,** is said to have effected the change. **Bernard Levy,** former manager, is now assistant to the vice-president. The company formerly worked on a nine hour day for five and a half days a week. The plant is now operating but five days a week.

J. Harry Hearnen, of the **Hearnen Storage Battery Service Company** and **Hearnen Safe and Lock Shop,** recently entertained his organization members at Hillwood Lakes, near here.

Flames recently caused slight damage at the plant of the **Trenton Brass and Machine Company.** The blaze was due to the cracking of a big smelting pot.

B. Lissberger & Company, who had joined with the **Trenton Smelting and Refining Company** and other New Jersey companies in petitioning the Interstate Commerce Commission against what is termed unreasonable rates charged by railroad companies to haul smelter supplies and products from Trenton to Baltimore, Worcester, Mass., and Bridgeport, Conn., have won their case, according to despatches from Washington. In an order issued the commission declared B. Lissberger Company were entitled to reparations of $2,263.48 with interest at 6 per cent from October, 1, 1922, from the Pennsylvania and Baltimore and Ohio Railroads, with interest from November 15, 1922, from the Pennsylvania and $555.12, with interest from April 15, 1922, from the Pennsylvania and the New York, New Haven and Hartford because of its several shipments over these lines. The railroad companies were ordered to pay these reparations before March 20, 1926.—C. A. L.

PITTSBURGH, PA.

April 1, 1926.

Activities have been well maintained in the metal industries throughout this district, during March. Both producers and railroad officials agree that the slump which followed the holidays and continued into February, has been passed without

becoming more than a temporary affair. Hardware sales are in fair volume. Sanitary goods plants are still operating at a high rate. Electrical merchandise is in fair demand, while radio supplies are less active.

The **Aluminum Company of America** has rented from F. W. Woolworth Company one-half of the fourth floor of the new Smithfield building at the corner of Smithfield street and Sixth avenue for a long term of years.—H. W. R.

MIDDLE WESTERN STATES

CLEVELAND, OHIO

April 1, 1926.

Conditions in the metal industry in the Cleveland territory are steady as the spring season opens. Manufacturers are anticipating a good season.

The **Rickersberg Brass Company** has bought a lot 200 by 200 feet on Kelley avenue between E. 37th and E. 38th street, Cleveland, on which to erect a new plant at once. It will be modern in every detail, contain 60,000 square feet of floor space and will cost more than $250,000 to build. The present site of the Rickersberg company at Perkins avenue and E. 37th street has been purchased by the city for $152,000 for the extension of Chester avenue. The new building will be completed by fall, officials state.

Officials of the **Ohio Brass Company,** Mansfield, O., report a steady increase in efficiency in working methods since the Foremen's Club was organized in 1920 by L. W. Olsen, works manager. The purpose of the organization is to instruct foremen in the policies of the concern and to solve common shop problems. This year the club is devoting its efforts to the elimination of waste in all departments by bringing to the personal attention of employes the need of care in this matter. Besides foremen, the membership includes cost, production and employment managers and members of the 17 technical departments. The club started with 52 names on its roster and now has 79. Officers are: H. S. Gulick, president; F. E. Blair, vice-president, and O. D. Steil, secretary.

The **Sozonian Burial Vault Company,** Toledo, has installed in its Dawson street plant the largest cauldron in the world for coating metal objects with molten zinc. The cauldron holds 175,000 pounds of zinc, and a temperature of from 850° to 900° F. is constantly maintained. Vaults are made of copper, overlaid with steel sheets.—S. D. I.

INDIANAPOLIS, IND.

April 1, 1926.

The **Marschke Manufacturing Company,** Indianapolis, has been taken over by the **Black & Decker Company,** with main offices at Towson, Md. Executives and branch managers of the Black & Decker Company, more than forty in number, arrived in Indianapolis recently to attend a meeting at which the announcement was made of the new addition to their operations. The Marschke Company manufactures electric grinders and buffers, also electrical tools and equipment of many kinds. Officials of the Black & Decker Company announced that the organization will continue as an Indiana corporation, with **F. W. Marschke,** senior member of the firm, serving as president of the Indianapolis company. **W. A. Rowe,** production manager for the Black & Decker Company, will be vice-president; **A. G. Decker,** treasurer, and **W. C. Allen,** industrial sales manager of the Black & Decker Company, secretary. **W. A. Marschke,** junior member of the Indianapolis firm, will serve with these four officers on the board of directors.

The **Twelve Points Plating Works,** Terre Haute, Ind., have begun operations at 1273 Phillips avenue in that city. **C. D. Rector,** who has had many years' experience in the business, is head of the new company, assisted by **Pearl Miller.** The new company will specialize in copper and nickel plating and will do a limited amount of molding.

Two building additions, which will increase the capacity of the **Anderson Stove Company,** Anderson, Ind., are to be constructed early in the spring, according to William Quinn, manager. Mr. Quinn said plans have been completed for extensions to the foundry and the main factory buildings. The program will enable the company to increase its production fifty per cent.

The **Hammond Brass Works,** at Hammond, Ind., has increased its capital stock from $50,000 to $150,000 all of the increase being common capital stock.—E. B.

DETROIT, MICH.

April 1, 1926.

The **Banner Brass Works** have been incorporated in Detroit with a special stock of $5,000 for the purpose of dealing in industrial materials. The stockholders are Clare D. Walsh, Ralston G. John and Albert H. Krohn, 7452 Linwood avenue, Detroit.

The **American Smelting Works** is the name of a new concern incorporated in Detroit. It has a capital stock of $10,000. Its purpose is to deal in refuse of brass works and refining of the same. The stockholders are John Panasuk, Zacharie J. Champian and Fred E. Atchison, 8727 Dexter boulevard.

A new process which is expected to facilitate chromium plating and is used extensively in the surfacing of bright finishes on automobile parts and other metal accessories, has been discovered in the laboratory of the Michigan State College, according to college officials. As is the case in many such instances of new chemical discoveries, the new formula was found through accident, a supposedly foreign matter having been spilled into a plating bath through mishap. It was found that the plate in this particular test bath took on an unusually thick coating of chromium, which, when dried, proved as lustrous as the thinner coats secured through the regular process. It also survived a number of tests which corroded and tarnished the other samples. **A. M. Malloy,** who has been engaged in extensive experimental work along this line, had previously prepared hundreds of sample plates for department tests in the use of chromium rather than nickel plate. The new process is expected to prove of great value in the automobile industry as the heavy plate shows unusual resistance to chemical fumes or the atmosphere.

The plant of the **Powell Brass Company,** of Grand Rapids, has been sold, it is announced, to **Achilles Despres,** furniture manufacturer, for $20,000.

The **National Manufacture & Plating Company,** Detroit, has increased its capital stock from $10,000 to $25,000.

Directors of the **Bohn Aluminum & Brass Corporation** have declared the regular quarterly dividend of 25 cents on the common stock, payable April 1, to stock of record of March 15.

The past month has witnessed the usual good business in practically all the copper, brass and aluminum plants in Detroit and its suburbs. Indications are that the coming four weeks will make an equally good showing. In fact everything looks good for a long period of prosperity in all these plants. The mills are all working to capacity.

The demand from the motor car companies shows no indication of declining. The only trouble just now is to keep up with demands. There is not an over abundant supply of either skilled or unskilled labor.

CHICAGO, ILL.

April 1, 1926.

The **Hi-Test Bronze Die Casting Company,** 326 W. Madison street, has been incorporated for $100,000 to manufacture and deal in bronze castings, cast in steel dies, die cast universal joints, etc. Incorporators are: Oscar Wahlgren, W. A. Murphy, Duane Reed. Correspondent, Reginald C. Darley, 58 West Randolph street.

The **Peterson Machine Company, Inc.,** 31 North Rockwell street, has been incorporated with a capital of $20,000, to manufacture and deal in machines, metal appliances, commodities and metal specialties. Incorporators are: Russell F. Peterson, Kathryne Lumb and Minnie B. Albright. Correspondent, Louis C. Horner, 111 West Washington street.

The **Thiplex Grinder Company,** 418 Sixteenth street, Moline, has been incorporated with a capital of $25,000, to manufacture and sell valve grinding machinery. Incorporators are: O. R. Seibert, Cecil Huyvaert and Bert Williams. Correspondents, Wood, McNeal and Warner, Moline.

The **James T. Marsh Company** has leased the four-story factory building at 2073 Southport avenue for a period of ten years at a total rental of $160,000. The new tenants will occupy the premises in the manufacture of their line of steam valves and gauges.

The **Hamilton-Ross Factories, Inc.,** manufacturers of lamps, have taken title to their plant at 736 Tilden street, for an indicated $105,000, subject to $39,000.

The **Roth Manufacturing Company,** with main office and factory at 1600 South Kilbourne avenue, has leased from **Clifford B. Bronson** the new one-story factory building at 4347 West Kinzie street for a term of five years at a total rental of $9,000. The building will be utilized for a brass foundry.

The **F. E. Hummel,** 1600 Fulton street, is receiving bids on a one-story factory building, 50 by 115 feet, of brick construction, to be built at the northwest corner of Albany and Ohio streets.—L. H. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

MARCH 15, 1926.

The industrial event of the month has been the British Industries Fair held at Birmingham, where the large buildings originally provided for the accommodation of air craft during the war were increasingly used, the stalls representing a frontage of eight miles, the covered area utilized being 200,000 square feet. The show was one very largely of metal products, because of the extensive use made of these by electrical firms, who sent specialties in large numbers. About 70 such firms took part in this exhibit, as compared with half a dozen in previous years. The brass industry made an unprecedented display, the department devoted to stamped goods including many novelties of up-to-date design. Decorative brass work, hearth furniture, illumination fittings and a variety of goods finished in brass and oxidized silver were largely responsible for the metallic glitter which met the visitor at every turn. Among the mechanical operations were shown new and improved methods for plating and electro-deposition of metals.

Probably, the most striking display by an individual industry was that of aluminum goods, of which an increasing proportion are now made of lighter ware to meet German competition. Larger quantities of this metal are now used in connection with cycle and motor manufacture. The Birmingham maker still prides himself on the heavy domestic ware, made up to 12 gage thickness, which he prefers to have regarded as his standard article.

The most interesting feature of a discussion by the Birmingham Metallurgical Society on the properties of metals at high temperatures was a statement on some recent and pending work made by **Dr. O. F. Hudson,** who for some time has been carrying out researches for the **British Non-Ferrous Metals Research Association.** Incidently, Dr. Hudson mentioned that the demand for metals capable of withstanding conditions of service at high temperatures is, in many directions, increasing and becoming more insistant. Further engineering progress is largely dependent on the discovery of new alloys able to resist high temperatures. Some work has been carried out by the Research Association at the **National Physical Laboratory,** and a special committee has been formed with **Dr. Rosenhain** as chairman, to plan work of research relative to nickel, cobalt, chromium, molybdenum, tungsten, etc. The scheme has been submitted to the department of **Scientific and Industrial Research,** who have now become associated with the work, forming a special committee of the **Engineering Board,** comprising six representing the board with the same number of the Research Association. Priority is to be given to the requirements of the admiralty, but the results are to be available confidentially to the members of the association. The investigations include testing of the resistance of alloys to erosion and chemical attack by sulphurous gases, slags, molten metals, etc.

A department of the metal trade showing decided expansion is that devoted to the production of fern pots, vases, rose-bowls and the like, which were formerly produced abroad, and are now almost entirely made in Great Britain, and very largely in Birmingham.

The brass trade in several ways shows expansion. The busiest department is probably that devoted to ornamental brass fittings for the equipment of new shops in London and elsewhere. A great deal of ingenuity has been shown in the development of new ornamental patterns for this class of decorative fitment. The trade in copper tubes for water conveyance is steadily increasing. An exhibition item which attracted a lot of public attention was the production in metal of colored toilet-ware, in which the appearance of the ordinary earthen ware vessels was successfully imitated. The general tube trade shows improvement with very good consignments to Spain, Portugal and other continental countries, although in this line very keen competition is met with from Germany. Business with South America is not quite as good as usual for the time of the year, the falling off being attributed to financial stringency.

A change of importance to the brass trade is the increasing use of bronzed iron for plated ware for such fittings as door handles and knobs, finger plates for artisans' houses and the general range of lower class dwellings, owing to the cheaper price charged, as compared with brass goods. The government's extending requirement of lime washing and the increased use of the syringe in horticulture has greatly stimulated the manufacture of brass syringes, now produced in large quantities in the Birmingham district.—J. H.

Business Items—Verified

The **Kramer Wagon Company,** Oil City, Pa., has installed an electro-plating department for refinishing auto parts.

Adams Brothers Company, Topeka, Kans., are considering the installation of a very small nickel plating plant for plating small stereotype plates.

The **Lefebure Ledger Company,** Cedar Rapids, Iowa, is erecting a building for the purpose of installing a nickel plating plant, in connection with its general business.

The **Kalamazoo Stove Company,** of Kalamazoo, Michigan, has awarded contract of the Ferro Enamel Supply Company at Cleveland for a complete new porcelain enameling department.

The fire which occurred recently in the grinding rooms of the **Roessler & Hasslacher Chemical Company,** New York, was very slight, and resultant damage was of practically no consequence.

The **De Vilbis Manufacturing Company** will spend more than $1,000,00 in 1926 on the enlargement of its plant and the beautification of its grounds. Work began in the Spring and will take about a year.

The Newark plant of the **Miner Edgar Company** was partially destroyed by fire on March 5, 1926. The company reports now, however, that they are in full operation, having suffered the loss of only a few days in production.

The **Globe Stove and Range Company,** of Kokomo, Indiana, is installing a large and up-to-date porcelain enameling department. Engineering and all equipment is being furnished by the Ferro Enamel Supply Company, of Cleveland, Ohio.

Lewis Campbell, Jr., Boyertown, Pa., has leased part of the plant of the Standard Foundry & Machine Company, and will operate a nickel plating business. This firm operates the following departments: grinding room, plating, polishing.

Leo D. Goddeyne, Bay City, Mich., is building a new and much larger shop, and is planning to add considerable new equipment to plate in copper, nickel, zinc, silver and gold. Besides the regular polishing, he will sand blast and do other finishing.

The new plant of the **West Michigan Brass Company,** Zeeland, Mich., is 110 x 134 ft., located on the main highway, running from Chicago to Grand Rapids, Mich. Charles D. Reeve, for 18 years manager of Grand Rapids Brass Company, is manager.

Pryor Brass Foundry Company, Marshalltown, Iowa, is considering plans for a one-story addition, and expects to begin work in the Spring. F. E. Schmidt is general manager. This firm operates the following departments: brass, bronze, aluminum foundry.

The **Portland Galvanizing Works,** Portland, Oregon, will build a two-story plant, 52 x 90 ft., to cost about $12,000. The company is managed and owned by Martin Leiser. The following departments are operated: galvanizing, brazing, tinning, soldering.

The Root Company, Chidsey avenue, Bristol, Conn., manufacturer of metal stampings, brass goods, etc., is completing an addition to its plant. This firm operates the following departments: brass machine shop, tool room, plating, stamping, polishing, lacquering.

Pittsburgh Reinforced Brazing & Machine Company, Pittsburgh, Pa., manufacturer of "Kerotest" valves and fittings, has changed its corporate title to Kerotest Manufacturing Company. This firm operates the following departments: brass machine shop, tool room, brazing.

Stanley W. Thatcher, Bangor, Pa., has organized the **Thatcher Company,** to operate a plant for the manufacture of iron, steel, brass and other metal products. The firm will operate a foundry later, but at present operates brass machine shop, and plating and polishing rooms.

The **Benedict Metal Works, Inc.,** 1654 Webster avenue, New York, manufacturer of drawn metal specialties, have preliminary plans for a three-story addition, estimated to cost $60,000. This firm operates the following departments: tool room, grinding room, spinning, plating, rolling mill, stamping.

The **North & Judd Manufacturing Company,** East Main street, New Britain, Conn., manufacturers of automobile hardware and kindred metal goods, have awarded a contract to the William H. Allen Company, New Britain, for rebuilding the portion of the foundry recently destroyed through collapsing of the roof.

James H. Rhodes & Company announce an increase in equipment of their felt factory at Jersey City for the further production of certain sheet felts. James H. Rhodes & Company have been manufacturing for some time, sheet felts particularly adapted for the painting and finishing trades as well as felt wheels for the metal industries.

The **Uehling Instrument Company,** Paterson, N. J., announces the appointment of W. B. McBurney, 619 Trust Company, of Georgia Building, Atlanta, Ga., as representative for Georgia and eastern Tennessee, in connection with Apex Co_2 recorders and indicators, fuel waste meters, and combined barometer and vacuum recorders.

The **Ellison Brass Manufacturing Company,** Jamestown, N. Y., has been changed to the **Ellison Bronze Company.** This firm operates the following departments: brass, bronze, aluminum foundry; brass machine shop, tool room, grinding room, casting shop, cutting-up shop, galvanizing, plating, stamping, tinning, soldering, polishing, lacquering.

May Brass & Foundry Company, Chicago, Ill., is making arrangements to move its plant to Ladoga, Ind., where larger facilities will be available. This firm operates the following departments: brass, bronze, aluminum foundry; brass machine shop, tool room, grinding room, casting shop, cutting-up shop, plating, japanning, tinning, soldering, polishing, lacquering.

Addition of two companies to its membership is announced by the **Copper & Brass Research Association,** 25 Broadway, New York. The new members are the American Metal Company, Ltd., refiners and dealers in metals and chemicals, 61 Broadway, and the Wheeler Condenser & Engineering Company, manufacturers of brass and copper tubing, 149 Broadway, New York.

The **Ferro Enamel Supply Company,** Cleveland, Ohio, announces the addition of **F. S. Markert** to its engineering department. Mr. Markert is a graduate of the University of Illinois and was formerly with the Belleville Enameling and Stamping Company. **E. O. McFaden** is now representing the Ferro Enamel Supply Company in the St. Louis district. Mr. McFaden was formerly with Ferro in Cleveland.

The **Zapon Company,** pioneer maker of pyroxylin base lacquer and lacquer enamels, announces the opening of a branch office and warehouse at 8810 Bessemer avenue, Cleveland. In the past, users of Zapon products in the Cleveland section have been served either from the factory in Stamford, Conn., or from the warehouse in Chicago. Consequently, this announcement of an arrangement which will materially speed up the time of deliveries on Zapon shipments is of vital interest to Zapon customers in the territory contiguous to Cleveland.

The **Northern Engineering Works,** of Detroit, Michigan, manufacturers of electric traveling cranes, hoists and foundry equipment, announce an extensive development in the last named department. The demand for foundry equipment has prompted them to extend their facilities in this direction and with added facilities and increased selling connections they will be in a considerably better position to serve the foundry trade. Aside from the company's district offices, maintained in all large cities, extensive representation has been established at central points throughout the country.

The **Whiting and Davis Company,** Plainville, Mass., is this year observing its golden anniversary. In 1876, the **Wade, Davis & Company** was organized, which developed into the firm of Whiting and Davis Company. During this period of fifty years the concern has worked its way up from a small jewelry manufacturing concern to one of the leading mesh-making establishments in the world. Much of this success has been due to the energy of **Charles A. Whiting,** president of the concern. This firm operates the following departments: tool room, brazing, plating, rolling mill, stamping, tinning, soldering, polishing, lacquering.

The **Lightolier Company,** 569 Broadway, New York, manufacturer of electric lighting fixtures and equipment, has purchased the eight-story and basement plant at Claremont and West Side avenues and Halstead street, Jersey City, N. J., totaling 238,700 sq. ft. of floor space. The property is now occupied under lease by the Western Electric Company, pending the completion of its new plant at Kearny, N. J., and the new owner will take possession in the near future. Manufacturing operations will be concentrated at this location. This firm operates the following departments: aluminum foundry, brass machine shop, tool room, grinding room, casting shop, spinning, brazing, plating, soldering, polishing, lacquering.

The **Specialty Brass Company,** Kenosha, Wis., has acquired one of the buildings of the Winther Motors Company group at Kenosha and will re-build and re-equip as a foundry, die casting and machine shop for immediate occupancy. It has outgrown its present shop at 915 Lester street, but is unable to enlarge at this location. The new shop will provide 25,000 sq. ft., compared with 13,000 sq. ft. at present. Centrifugal milk pumps for creameries, brass fittings, bearing metal, etc., are manufactured. The company is capitalized at $75,000. This firm operates the following departments: brass, bronze, aluminum foundry, brass machine shop, tool room, grinding room, plating, japanning, tinning, soldering, polishing, lacquering.

Specialty Brass Company, Kenosha, Wis., is completing the removal of its entire operation from 900 S. Howland avenue, a month earlier than planned due to the effect of flood conditions which enforced idleness. Some time ago, floor space was secured in a section of the former Winther Motor Truck Company with a view of occupancy the early part of April. Five new brass furnaces and one oil furnace have been installed, and the equipment of the old plant is being moved to the new location. The principal line is brass fittings for dairy and creamery needs, and a new centrifugal type milk pump. This firm operates the following departments: brass, bronze, aluminum foundry; brass machine shop, tool room, casting shop, plating, tinning, polishing.

Industrial and Financial News

INCORPORATIONS

The **Armco Metal Products Company,** Delavan, Wis., has been organized to manufacture a line of art metal goods, stampings, wire goods and forgings.

Electrical Brass Company, Inc., Bristol, Conn., has been incorporated with a capital of $50,000, for the manufacturing and jobbing of lighting fixtures and fixture parts.

The **Banner Brass Works,** Detroit, Mich., has been incorporated with a capital of $5,000. This firm will operate the following departments: brass, bronze and aluminum foundry; grinding room.

The **Electro Flushing and Manufacturing Company,** Milwaukee, Wis., has been incorporated with $40,000 capital stock to manufacture plumbers' specialties, equipment, fixtures and devices, principally a motor-operated machine for flushing sewers, waste and drain pipes. The incorporators are: H. W. Tews, 1101 Sherman Boulevard, Ernest Jahn and Alfred J. Willis. The following departments will be operated: brass foundry, tool room, casting shop.

NEW PERMANENT MOLD COMPANY

The Metal Mold Castings Company, Inc., a new New York State Corporation whose capitalization is 750 shares of preferred stock, par value $100.00 per share and 10,000 shares of no-par common has been formed to manufacture permanent mold aluminum castings at Buffalo, N. Y. This corporation has purchased by stock transfer the assets of the Bronzo Alumina Corporation of 212 Winchester avenue, Buffalo, N. Y., one of the oldest manufacturers of permanent mold aluminum castings in the United States. On April 1st, the business and properties of the Bronzo Alumina Corporation, which will be dissolved, will be turned over to the new corporation and will be operated from that time on under the name of The Metal Mold Castings Company, Inc.

The officers of the Metal Mold Castings Co., Inc., are Theodore H. Pickering, President; J. Earnest Kauffmann, Vice President and Chief Engineer; and Eames Donaldson, Secretary and Treasurer. Mr. Pickering was foormerly Foundry Manager of Josiah Anstice & Company, Rochester, N. Y., and is well known in the foundry industry. Mr. Kauffmann, is one of the foremost authorities on permanent mold aluminum castings in the United States, and has been president of the Bronzo Alumina Corporation since its incorporation. Mr. Donaldson, likewise, has been associated with the Bronzo Alumina Corporation for the last six years. In addition to acting as secretary and treasurer of the Metal Mold Castings Company, Inc., he also will be sales manager.

NEW BRONZE COMPANY

The Janney Cylinder Company announced the opening of their new Plant and Office recently, at Holmesburg, Philadelphia. Walter T. Janney is President and Treasurer and Charles R. Spare is Vice-President and Sales Manager. The latter was President and General Manager and the former was Chief Engineer and head of the Technical Department of the American Manganese Bronze Company, Holmesburg, Philadelphia. The Janney Patented Process was formerly licensed to and operated by the American Manganese Bronze Company but this license has been cancelled and sole rights for the manufacture and sale of Janney pressure castings are now vested in the new company.

As the result of over four years of extensive experimental work they have developed a new process for the casting of non-ferrous metals under pressure. Various high test bronzes including high tensile manganese bronze, phosphor bronze, aluminum, and the other bronzes, bearing metals, Monel metal and Everbright are cast in cylindrical form. Cylinders are produced suitable for pump liners, press liners, shaft sleeves, bushings, rolls and rings. These parts are sold rough machined, or finished to exact dimensions.

The new plant of fireproof construction all in brick and steel, contains its own power plant, and specially designed melting equipment, casting machines, machine shop, inspection and testing department and shipping floor. The handling facilities are of the most modern type, the work being started at one end and the finished product delivered at the other. The plant is located between Tacony and Holmesburg Junction on the main line of the New York Division of the Pennsylvania Railroad.

NEW ALUMINUM ROLLING MILL

The United States Aluminum Company is building a plant in Massena, N. Y., to manufacture aluminum alloy rods, and bars for structural purposes. This plant will cost about $750,000 and will consist of a melting room 70 x 160 feet, to be located just north of the present wire mill and east of the melting room. Attached to this new melting room on the east will be the new fabricating plant occupying a floor space 150 x 420 feet. These buildings will be of typical mill construction with steel frames and brick and concrete walls and floors. The melting room is to be fitted with floors of cast iron plates and electric furnaces will be installed.

The rolling mill will be equipped with four rolling mills, two of 18-inch capacity, one of 12-inch capacity, and one of 10-inch capacity. One of these 18-inch mills has already been purchased and during the past winter a building 60 x 110 feet was so constructed that it will become part of the completed mill. In this new mill all kinds of rods, moldings and structural aluminum alloys will be made.

BRONZE COMPANY CHANGE

The **American Manganese Bronze Company,** of Philadelphia, has recently consolidated its organization under one management. T. H. Addie, formerly vice-president and treasurer has been elected president and general manager. Mr. Addie has been an officer of the company since 1914. The company has a reputation among the shipping trade and with the U. S. Shipping Board as manufacturers of propellers. The water turbine-runners is another specialty. Bronze castings and forgings for engineering purposes covers their field in a general way. They have several special acid-resisting alloys and a new acid valve. Besides their special lines involving high test metals and heavy castings, the American Manganese Bronze Company, is now, under the new organization, in a position to do a great variety of foundry work of any commercial grade of bronze.

MANHATTAN BRASS COMPANY LIQUIDATES

Announcement was made on March 30, 1926, by the Manhattan Brass Company of New York of their decision not to renew their charter of incorporation, and to liquidate. This company has been in business since 1865. At the present time no decisions have been made regarding the disposal of the land, buildings, equipment, etc. The company is busy completing all orders on the books and selling the stock on hand.

MERCURY AND THALLIUM FROM LEAD

Another experiment in the transmutation of elements was reported by the Scientific American, which said that Drs. A. Smits and A. Karssen of the University of Amsterdam had succeeded in transmuting lead into mercury and thallium by heating lead electrically in a high vacuum.

The lead was first elaborately purified to make sure that other elements would not be in it. After being heated the light given off by the hot lead was examined spectroscopically. Under this analysis, the characteristic rays produced by mercury and thallium appeared and were photographed. Again and again this experiment was repeated with success, it was reported.

PLATING RUBBER

At a recent meeting of the American Chemical Society, Dr. S. W. Sheppard announced his success in the deposition of rubber from suspensions and emulsions from latex, the raw material, through the medium of an electro-plating bath.

His method is briefly, to add a little ammonia to the latex and to add, in addition, the impurities to make it fit for vulcanizing, such as sulphur, etc. After these additions, the "adulterated" latex can be treated as a plating solution and rubber plated out of it. This rubber, in sheets, rolls or other forms, can be vulcanized without difficulty.

"LEAD" GASOLINE NOT DANGEROUS

Tetraethyl lead gasoline is not a menace to public health, and there is no reason for prohibiting its sale for commercial purposes under proper regulation, in the opinion of a special committee appointed by Surgeon General Cumming of the Public Health Service, announced January 10, 1926, in Washington, D. C.

The investigation was ordered last May following agitation after the death of five workmen at the Bayonne, N. J., plant of the Standard Oil Company of New Jersey.

The committee pointed out however, that the health hazard in the manufacture and blending of tetraethyl lead was serious and must be the subject of precise regulation and care. The committee asked that provision be made for a continuing study.

Tentative regulations governing the manufacture, distribution, and use of tetraethyl lead gas and suggestions for regulations covering the sanitation of garages have been submitted by Surgeon General Cumming, of the United States Public Health Service, to the health officers of the various States for their consideration, comment and criticism. These regulations, when finally adopted, will mark a distinct step forward in the safeguarding of the manufacture and handling of dangerous chemicals.

1925 CENSUS

The Bureau of the Census is now engaged in collecting the data for the biennial census of manufactures, which will cover industrial operations during the calendar year of 1925. This census is required by an act of Congress approved March 3, 1919.

The schedules or questionnaires have already been mailed to all the manufacturers. The metal industries are very much interested in the success of the census, which will depend not only on the accuracy of the statistics but on the promptness with which they are published. The Director of the Census has agreed to make a tabulation for each city within a few weeks after the receipt of the last schedule, **properly and accurately filled out,** and to publish the results of this tabulation in the form of a preliminary report.

At the census of 1923 it was necessary to send more than 100,000 letters to manufacturers requesting additional information or verification or correction of their reports. This, of course, delayed considerably the publication of the statistics. It is highly important, therefore, to answer each question as accurately as possible and mail the report **promptly** to the Bureau of the Census.

ALUMINUM IN 1925

The value of new aluminum produced in the United States during 1925 was $36,430,000, a decrease of a little over 3 per cent as compared with 1924, according to information furnished by J. M. Hill, of the Bureau of Mines, Department of Commerce. The decrease was in part attributable to the drought in the Eastern States, which caused the shutting down of 2 plants for some weeks.

Imports ("general") of aluminum metal, scrap, and alloy in 1925 increased nearly 48 per cent as compared with 1924, reaching a total of 43,409,546 pounds valued at $10,180,497, in 1925. Imports of plates, sheets, and bars, on the other hand decreased 87 per cent, amounting to only 102,338 pounds, valued at $47,740, in 1925.

Exports of aluminum ingots scrap, and alloys in 1925 were 8,130,222 pounds, valued at $1,835,213, an increase of 142 per cent as compared with exports in 1924. Exports of plates, sheets, bars, etc., in 1925 were over 50 per cent greater than the quantity sent abroad in 1924, but tubes, moldings, castings, and table and other manufactured ware were exported in about equal amounts in 1924 and 1925. The total exports of aluminum in 1925 were 19,105,226 pounds, valued at $6,057,071.

DOEHLER EARNS $460,992

The Doehler Die-Casting Company, of Brooklyn, New York, in its report for 1925 shows earnings, before preferred dividends and taxes, of $460,952, equal after these charges to $2.73 per share on the 150,000 shares of no par value common stock outstanding. Sales in 1925 were $6,749,647, against $5,530,384 in 1924.

FEDERATED METALS REPORT

In his annual report to stockholders, Benjamin Lissberger, President of the Federated Metals Corporation, said the company was in a stronger position than when it started in June, 1924. The statement covers eleven months to November 30, 1925. Net sales were $51,651,349, and net operating profit $485,973. Mr. Lissberger said that since June 1, 1924, more than $800,000 had been expended on improvements in addition to place facilities, and $120,000 of bonds had been acquired for the sinking fund.

COPPER EXPORT ASSOCIATION

C. F. Kelley, president Anaconda Copper Mining Company and chairman of committee of copper producers that has been considering formation of a new and more comprehensive copper export association, states: "A preliminary conference in which most of the copper producers interested in foreign markets have participated has resulted in the drafting of a plan for the formation of an export association under provision of the Webb-Pomerene law. Drafts have been submitted to counsel of the respective companies.

"It is understood that practically all the American producers including representatives of the custom smelting companies and several of the foreign operators have been sitting in at meetings."

METALS IN FRANCE

Revised data just issued by the Comité des Forges show that the upward trend in the production and consumption of the leading non-ferrous metals during recent years was continued in 1924. The consumption of aluminum, lead, copper, tin, and zinc in that year exceeded that of 1923 by percentages ranging from 10 to 25, and showed increases over the pre-war year 1913, except in the case of lead. The production of each of these metals was larger in 1924 than in 1923, but only aluminum had an output exceeding that of 1913. The production of lead and zinc, however, continued the upward tendency of preceding years, and it has been estimated that the record of 1925 will closely approach the pre-war level. —COMMERCE REPORTS.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America....	...	$ 64	$ 67
American Hardware Corporation....	$100	81	84
Anaconda Copper	50	43⅞	44
Bristol Brass	25	6	9
International Nickel, com	25	34⅝	34⅞
International Nickel, pfd.....	100	102	103
International Silver, com.....	100	94	96
International Silver, pfd.....	100	100	105
National Enameling & Stamping....	100	27½	28
National Lead Company, com.....	100	146½	147
National Lead Company, pfd.....	100	116	117
National Lead Company, pfd.....	100	116	117
New Jersey Zinc	100	180	189
Rome Brass & Copper.....	100	130	138
Scovill Manufacturing Company.....	...	225	235
Yale & Towne Mfg. Company, new	...	61	63

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

GERMAN METAL MARKET

The general depressed economic situation in Germany has affected the market for both metals and ores. The position of German brass manufacturers is said to be difficult financially in spite of a good potential demand for brass articles. One favorable circumstance is that stocks are limited, owing to the high-priced money, which made it inadvisable to tie up capital in dead stock. There is consequently likely to be immediate purchasing of metals when the general buying capacity is improved.

The Russian market has been absorbing considerable quantities of copper during recent months, but these purchases have been greatly reduced. There is overproduction of zinc in Germany for the German market at present and zinc prices are lower than in New York.

Lead prices are lower than in New York, due to the arrival of large quantities from Australia, tied up earlier by the Australian shipping strike.

German aluminum is being exported to America in considerable quantities in spite of the high tariff. (Trade Commissioner Theodore Pilger, Berlin, in Foreign Trade Notes.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President, Whitehead Metal Products Company of New York, Inc.

April 1, 1926.

Some feeling of doubt as to business conditions in the near future has been experienced by a few of the leading factors in the brass and copper industry, but it cannot be said that very many, if any, are definitely pessimistic. Those who are inclined to regard the stock market as an indication of what will follow in trade channels are naturally being unfavorably impressed by the recent slump in the market, although it is admittedly difficult to find any reason for believing that fundamental conditions are other than sound. As a matter of fact, in the first quarter of the year, all the mills had the best business, both as to volume and profits that they have enjoyed since the war, and in some instances reports indicate that the tonnage shipped exceeds any period of three months in the war years.

Practically all of this production is going into immediate consumption and no stocks are being accumulated. The automobile industry was reported to have curtailed somewhat. It is said that the demand for cars was influenced by the weather conditions and also by the fact that many buyers were waiting for April 1st to take delivery of cars since the revised tax becomes effective on that date and represents a 2% saving in the tax. There is probably some degree of accuracy in both of these explanations as it was noted that in the last week of March some large orders for brass and copper were released by automobile manufacturers, and reports indicated that production of cars was being resumed. The building trades are still very active and consuming large quantities of both sheet copper and brass pipe.

The production of electric refrigerating units continues to develop with amazing speed. New companies are getting under way on a tremendous scale and the older concerns are expanding at a terrific rate. Enormous orders for sheet copper, copper tube and Monel metal have been placed during March by manufacturers of these refrigerating machines which are being built for private homes and stores. In most of the new apartment houses, and many private homes throughout the country, these refrigerators are being installed by the builders.

In the white metal lines consisting of nickel and copper nickel alloys, the manufacturers are enjoying a high degree of prosperity. Order books are larger than ever and constantly increasing. Producers of pure nickel and Monel metal are making new production records each month, and booking more than is being shipped. This is accounted for by the expansion in consumption in established fields, and the continual opening up of new applications for the metal. The Ritz-Tower in New York, for example, is being equipped throughout for plumbing and sheet metal work in copper and brass, and with Monel metal kitchen equipment, and nickel cooking utensils. This is but one of many similar installations and is cited by way of illustration.

It is difficult to see any justification for pessimism as to the future in this industry unless the entire business of the country receives a body blow from some unexpected source.

Metal Market Review

Written For The Metal Industry By R. J. HOUSTON, of D. Houston & Company, Inc., Metal Brokers, New York

April 1, 1926.

COPPER

A substantial amount of business was transacted during the first half of the month just closed, chiefly with domestic consumers, for April and May shipment, with a fair aggregate for export. Early in the month orders were booked at 14⅛ delivered to Connecticut mills, but subsequently prices became firmer at a shade above 14⅛. The stronger phase of the situation was soon dissipated by the development of weakness in the London market and freer offerings at concessions.

However, although the market has suffered a setback to 13⅞c delivered terms, manufacturing industry continues in a strong and prosperous condition at the present time. Domestic consumption is maintained on an enormous scale, as shipments of 140,812,000 pounds to home consumers in February fully attest, and demand for fabricated products of copper is in keeping with the heavy shipments of the raw metal. World production of copper in 1925 is estimated at 1,440,300 metric tons but deliveries for consumption are computed at 1,511,000 metric tons, being 70,700 tons in excess of the production. The deficiency of production was made up from surplus stocks. Copper is abnormally low, but is likely to score a decided market rally in the near future.

ZINC

Irregularities in market tendencies and fitful buying movements have characterized the zinc situation lately. The present rate of production is not conducive to any market stimulation of prices. The general volume of consumption provides a substantial outlet for supplies, but with an increase in stocks of slab zinc of 6,041 tons during February buyers are not inclined to bid up prices. Stocks at the end of February were 20,341 tons, compared with 9,295 tons on December 31, 1925. Consumers have been conservative lately, but with any sign of further pronounced curtailment of output there would be probably a noticeable increase of business.

TIN

Conditions in the tin market remained fundamentally strong during March. Consumption is apparently in the lead, and this is the big factor in the situation. If the world's visible supply undergoes further serious reductions, market movements are likely to be irregular and erratic. The statistical position in itself is sufficiently strong to furnish the market with all the potential support it needs for sometime to come. During March prompt delivery of Straits tin advanced to 66c per pound, and sales of Standard tin in London were made at £300 10s.

American tin deliveries during February amounted to 6,250 tons, as compared with 7,205 tons in February, 1925. Deliveries for the first two months of this year were 13,590 tons, against 11,830 tons for the two previous months, being an increase of 1,760 tons. Total visible supply on February 28, 1926, amounted to 16,239 tons, against 23,591 tons on February 28, 1925, a decrease of 7,352 tons in the 12 months.

LEAD

An outstanding feature of the lead market recently was the repeated price reductions. The readjustments followed a more general pressure to sell both here and abroad. A new level of

values was therefore necessary to stimulate buying on large scale volume. Heavy demand was started at the 8c St. Louis basis, and after the leading producer marked down the New York price to 8.20c. These prices compare with 8.75c St. Louis and 8.90c New York, at the beginning of March. A large number of requirements came into the market at the low level for the month, and this enabled producers to hold the domestic market steady at current quotations. London showed a weaker price trend lately. Surplus stocks in England and reported falling off of demand in Germany are aspects of the situation overseas. Domestic consumption is good, but present prices are in harmony with a large outlet for supplies.

ALUMINUM

Demand for aluminum is being realized by producers on a large scale. Heavy consumption of the metal is kept up by the automobile makers, and indications point to high records throughout the motor industry. Producers are enlarging facilities of output also in anticipation of favorable business conditions. Prices are steady at 28c for 99 per cent plus virgin ingot and 27c for 98-99 per cent grade. Imports of aluminum have been heavy recently, but shipments have been going out on a large scale also. Indications are for a heavy consumption in second quarter of year.

ANTIMONY

There was considerable activity in the market for antimony during the last half of March. Consumers showed renewed interest and bought substantial shipments for April and May arrival on the basis of 18½c and 18c respectively. Supplies of spot antimony are small. Sales of March and April shipment from China were reported at 17c. More recent demand, however, is quiet and tone of market weaker. Shipments from China during January and February are reported to have been 1,150 tons for the two months. Spot regulars is held at 19c duty paid, but recent offers of April-May shipment from China were heard of at 15¼c duty paid. Consumers appear to be pretty well satisfied for nearby requirements.

SILVER

Market for silver has continued easy for sometime past. Operations have not been important enough to stiffen prices. Recent quotations fell off to 65⅝ cents at New York, with London 30¼d. Silver production of North America and Peru in February amounted to 15,376,098 ounces compared with 15,524,404 ounces in January. Opposition to the purchase of 14,000,000 ounces of domestic silver at $1.00 an ounce under the Pittman bill has developed at Washington.

QUICKSILVER

The market remains steady at $89.50 to $90 per flask. There is a fair demand from trade sources. Imports have increased over the last several months, but consumers are in position to take care of supplies for most part.

PLATINUM

There has been an easier tendency lately, with refined quoted at $106.25 an ounce. New sources of supply are coming into sight, and the trade looking for a downward tendency.

OLD METALS

There has been a fair distribution of scrap metals, and for special grades of material offerings were well absorbed. An easier tendency developed in some quarters of the trade, and dealers were more reserved in paying former prices for the copper scraps. Aluminum and lead were in good demand at fair quotations. Consumers are taking a fair tonnage from the smelting people, and more activity is looked for within the next 30 days. Dealers were recent buyers at 9½c @ 9⅝c for light copper, 11½c @ 11¾c for heavy copper, 7c @ 7¼c for heavy brass, 9¼c for new brass clippings, 6¾c @ 7c for heavy lead, and 21½c @ 22c for aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1925, 14.427—January, 1926, 14.25c—February, 14⅜c.—March, 14.25c.

Brass Mill Zinc—Average for 1925, 8.263—January, 1926, 9.00c—February, 8.20c.—March, 7.80c.

Daily Metal Prices for the Month of March, 1926

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	5	8	9	10	11	12	15	16	17
Copper (f. o. b. Ref.) c/lb. Duty Free...													
Lake (Delivered)	14.375	14.375	14.25	14.25	14.375	14.375	14.375	14.375	14.375	14.25	14.25	14.25	14.25
Electrolytic	14.00	13.95	14.00	14.05	14.10	14.15	14.10	14.10	14.10	14.00	14.05	14.10	14.10
Casting	13.50	13.45	13.50	13.50	13.55	13.55	13.55	13.55	13.50	13.40	13.40	13.45	13.50
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	7.45	7.40	7.40	7.45	7.50	7.50	7.40	7.35	7.35	7.275	7.30	7.35	7.50
Brass Special	7.60	7.55	7.55	7.55	7.60	7.60	7.55	7.50	7.40	7.375	7.40	7.50	7.575
Tin (f. o. b., N. Y.) c/lb. Duty Free...													
Straits	64.50	64.00	63.50	63.875	64.00	63.75	64.00	64.50	65.25	65.00	65.00	66.00	66.00
Pig 99%	63.75	63.125	62.625	62.75	63.00	62.625	63.00	63.25	64.25	64.00	64.00	64.875	64.875
Lead (f. o. b. St. L.) c/lb. Duty 2¼c/lb.	8.75	8.60	8.50	8.40	8.50	8.40	8.30	8.15	8.15	8.00	8.00	8.00	8.00
Aluminum c/lb. Duty 5c/lb.	28	28	28	28	28	28	28	28	28	28	28	28	28
Nickel c/lb. Duty 3c/lb													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	20.75	20.50	20.25	20.00	20.00	19.50	19.25	19.00	19.00	19.00	18.75	18.50	18.50
Silver c/oz. Troy Duty Free	66.25	66.25	65.75	65.75	66.00	66.00	66.375	66.00	66.125	66.00	65.875	65.875	66.00
Platinum $/oz. Troy Duty Free	108	107	107	107	109	109	109	109	106	106	106	106	106

	18	19	22	23	24	25	26	29	30	31	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free...													
Lake (Delivered)	14.25	14.25	14.25	14.25	14.25	14.25	14.125	14.125	14.00	14.125	14.375	14.125	14.261
Electrolytic	14.10	14.10	14.00	13.90	13.85	13.75	13.75	13.80	13.70	13.80	14.10	13.70	13.980
Casting	13.50	13.50	13.45	13.45	13.375	13.30	13.30	13.30	13.25	13.30	13.55	13.25	13.440
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	7.50	7.50	7.50	7.40	7.30	7.125	7.15	7.125	7.10	7.125	7.50	7.10	7.350
Brass Special	7.60	7.60	7.60	7.50	7.40	7.25	7.30	7.25	7.20	7.225	7.60	7.20	7.464
Tin (f. o. b., N. Y.) c/lb. Duty Free...													
Straits	65.00	65.25	65.25	65.25	64.75	64.125	64.125	63.875	63.00	63.375	66.00	63.00	64.495
Pig 99%	64.00	64.00	64.00	63.875	63.50	63.00	63.00	62.625	62.00	62.375	64.875	62.00	63.413
Lead (f. o. b. St. L.) c/lb. Duty 2¼c/lb.	8.10	8.15	8.15	8.15	8.15	8.15	8.15	8.10	8.10	8.10	8.75	8.10	8.220
Aluminum c/lb. Duty 5c/lb.	28	28	28	28	28	28	28	28	28	28	28	28	28
Nickel c/lb. Duty 3c/lb													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	18.50	20.00	20.50	20.50	20.50	25.25	19.00	18.75	18.50	18.00	20.75	18.00	19.457
Silver c/oz. Troy Duty Free	65.75	65.875	65.875	66.00	65.875	65.625	65.625	65.75	65.50	65.375	66.375	65.375	65.891
Platinum $/oz. Troy Duty Free	106	106	106.25	106.25	106.25	106.25	106.25	106.25	106.25	106.25	108	106.25	106.826

Metal Prices, April 5, 1926

NEW METALS

Copper: Lake, 14.125. Electrolytic, 13.85. Casting, 13.40.
Zinc: Prime Western, 7.20. Brass Special, 7.30.
Tin: Straits, 64.00. Pig, 99%, 63.00.
Lead: 8.10. **Aluminum,** 28.00. **Antimony,** 18.25.
Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets cobalt free, 40.
Quicksilver, flash, 75 lbs., $89.50. **Bismuth,** $2.70 to $2.75.
Cadmium, 60. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 65.375.
Gold, oz., Troy, $20.67. **Platinum,** oz., Troy, $106.25.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10¾to11¾
Brass Ingots, Red	11¾to12¾
Bronze Ingots	11¾to12¾
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	23 to41
Manganese Bronze Ingots	13 to17
Manganese Bronze Forging	34 to42
Manganese Copper, 30%	28 to45
Monel Metal Shot	32
Monel Metal Blocks	32
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	18⅞to22½
Phosphor Copper, guaranteed 10%	18 to21½
Phosphor Tin, guaranteed 5%	70 to80
Phosphor Tin, no guarantee	65 to75
Silicon Copper, 10% ....according to quantity...	28 to35

OLD METALS

Buying Prices		Selling Prices
11½to11¾	Heavy Cut Copper	13 to13½
11¼to11½	Copper Wire	12¾to13
9¾to10	Light Copper	10¾to11¼
9 to 9¼	Heavy Machine Composition	10½to10¾
7¾to 8	Heavy Brass	9 to 9¼
6¾to 7	Light Brass	8 to 8¼
7¾to 8¼	No. 1 Yellow Brass Turnings	9½to10
8¾to 9¼	No. 1 Composition Turnings	10½to11
7¼to 7½	Heavy Lead	8 to 8¼
5 to 5¼	Zinc Scrap	6 to 6½
12 to13	Scrap Aluminum Turnings	15 to17
19 to20	Scrap Aluminum, cast alloyed	21 to22
22½to23	Scrap Aluminum, sheet (new)	24 to25½
38 to40	No. 1 Pewter	42 to44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	21½c. to 22½c. net base
From stock	22½c. to 23½c. net base

BARE COPPER WIRE

16¼c. to 16⅜c. net base, in carload lots.

COPPER SEAMLESS TUBING

24¼c. to 25¼c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	21 c. net base
100 lbs. to 200 lbs. in one order	21½c. net base

ZINC SHEET

Duty, sheet, 15% Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount ..... 11.75 net base
Casks, jobbers' price ..... 13.00 net base
Open Casks, jobbers' price ..... 13.50 to 13.75 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	40c.
Aluminum coils, 24 ga., base price	36.70c.
Foreign	40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	58c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	50c.	Hot Rolled Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c or over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver, 66 to 68c.

BRASS MATERIAL—MILL SHIPMENTS

In effect March 26, 1926
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18⅞	$0.20⅜	$0.22⅜
Wire	.19⅜	.20⅞	.22⅞
Rod	.16⅝	.21⅛	.23⅛
Brazed tubing	.26⅞	.....	.32⅛
Open seam tubing	.26⅞	.....	.32⅛
Angles and channels	.29⅞	.....	.35⅛

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23½c. to 24½c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20⅞c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18⅞c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19⅞c. net base
Muntz or Yellow Metal Rod	16⅞c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26¾c.	10% Quality	29¾c.
15% "	28¼c.	15% "	33½c.
18% "	29½c.	18% "	36¼c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35	Hot Rolled Sheets (base)	42
Cold Drawn Rods (base)	43	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, April 5, 1926

ANODES

Copper: Cast	21⅞c. per lb.	**Nickel:** 90-92%	45c. per lb.
Rolled	21⅜c. per lb.	95-97%	47c. per lb.
Electrolytic	19 c. per lb.	99% plus	49c. per lb.
Brass: Cast	20⅞c. per lb.	**Silver:** Rolled silver anodes .999 fine are quoted from 68¼c. to 70¾c. per Troy ounce, depending upon quantity purchased.	
Rolled	21⅜c. per lb.		
Zinc: Cast	14¾c. per lb.		

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$33.70–35.20
14" 20 ply 64/68 Unbleached	43.40–43.80
12" 20 ply 80/92 Unbleached	34.25
14" 20 ply 80/92 Unbleached	46.40
12" 20 ply 84/92 Unbleached	41.90–45.25
14" 20 ply 84/92 Unbleached	56.80–60.55
12" 20 ply 80/84 Unbleached	40.15–41.35
14" 20 ply 80/84 Unbleached	54.40–55.70

Sewed Pieced Buffs, per lb., bleached .70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.12–.16
Acid—Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., Carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., Carboys	lb.	.02
Alcohol—Butyl	lb.	.18½–.23
Denatured in bbls	gal.	.40
Alum—Lump Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech, bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.30
Copper— Acetate (Verdegris)	lb.	.37
Carbonate, bbls	lb.	.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls	lb.	.05
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate (Copperas), bbl	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.15
Nickel—Carbonate dry, bbls	lb.	.29
Chloride, bbls.	lb.	.19
Salts, single 300 lb. bbls	lb.	.10½
Salts, double 425 lb. bbls	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.09¼
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 80-85%	lb.	.06
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide (Fluctuating Price)	oz.	.66
Nitrate, 100 ounce lots	oz.	.47
Soda Ash, 58%, bbls	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls	lb.	.04¾
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.43½
Tripoli, Powdered	lb.	.03
Wax—Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.11
Chloride, casks	lb.	.07½
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½